

The Hawaiian Species of *Conus* (Mollusca: Gastropoda)¹

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IN THE COURSE OF a comparative ecological study of gastropod mollusks of the genus *Conus* in Hawaii (Kohn, 1959), some 2,400 specimens of 25 species were examined. Uncertainty of the correct names to be applied to some of these species prompted the taxonomic study reported here. Many workers have contributed to the systematics of the genus *Conus*; nevertheless, both nomenclatorial and biological questions have persisted concerning the correct names of a number of species that occur in the Hawaiian archipelago, here considered to extend from Kure (Ocean) Island (28.25° N., 178.26° W.) to the island of Hawaii (20.00° N., 155.30° W.).

FAUNAL AFFINITY

As is characteristic of the marine fauna of the Hawaiian Islands, the affinities of *Conus* are with the Indo-Pacific center of distribution. The Hawaiian Islands mark the northeastern limit of most of the species that occur there. Eastern Pacific species of *Conus* are entirely absent from the Hawaiian fauna.

Most of the species present in Hawaii range widely throughout the central and western Pacific Ocean, Indian Ocean, and Red Sea. The chief mode of distribution is the pelagic veliger larval stage. Drifting while attached to floating material may be a secondary mechanism. Despite the extensive distribution of most of the species occurring in Hawaii, the geographic position of the archipelago and the prevailing westerly surface

currents are factors which could plausibly effect the isolation necessary for geographic speciation.

Of the 33 species of *Conus* considered in this paper to be valid constituents of the Hawaiian fauna, about 20 occur in shallow water on marine benches and coral reefs and in bays. Of these, only one species, *C. abbreviatus* Reeve, is considered to be endemic to the Hawaiian archipelago. Less is known of the species more characteristic of deeper water habitats. Some, known at present only from dredgings about the Hawaiian Islands, may in the future prove to occur elsewhere as well, when adequate sampling methods are extended to other parts of the Indo-West Pacific region.

ECOLOGY

Since the ecology of *Conus* has been discussed in detail elsewhere (Kohn, 1959), ecological data are restricted to notes in this report.

It is a pleasure to acknowledge the constant stimulation and willing assistance of Karl W. Greene, director, Children's Museum of Honolulu, and Edwin H. Bryan, Jr., curator of collections, Bernice P. Bishop Museum, Honolulu. The collections and libraries of the following institutions were also visited, and gratitude is expressed to the persons in charge: U. S. National Museum (H. A. Rehder, J. P. E. Morrison), Academy of Natural Sciences of Philadelphia (R. T. Abbott), Museum of Comparative Zoology, Harvard University (W. J. Clench, R. D. Turner), and Bernice P. Bishop Museum (Y. Kondo). In addition, specimens were loaned to the writer for study by C. A. Allen, Mrs. Jean Bromley,

¹ Contribution No. 117, Hawaii Marine Laboratory. Manuscript received July 30, 1957.

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Mrs. A. M. Harrison, W. C. Ross, and C. S. Weaver. Valuable assistance rendered by Charles E. Cutress in preparation of the color photographs is gratefully acknowledged. Most of the work was carried out at the Osborn Zoological Laboratory, Yale University, during tenure of a fellowship from the National Science Foundation.

BIBLIOGRAPHICAL NOTES

An excellent bibliographical account and collation of the major works in which species of *Conus* were described is given by Hanna and Strong (1949). Except where otherwise noted, the collations cited therein are followed in the present paper.

Catalogue of the Portland Museum. 1786. This catalogue was published anonymously, but its authorship is usually attributed to George Humphrey (Dall, 1921). The names of new species are attributed to Daniel Solander in the volume, and the same usage is followed in the present paper. A valuable discussion of this catalogue is given by Wilkins (1955), who also presents cogent reasons for attributing the names to Humphrey.

J. G. Bruguière. *Encyclopédie Méthodique. Histoire Naturelle des Vers*. 1792. Many previously undescribed species of *Conus* were named and carefully described in this work. However, the authorship to be attributed to these names has been a matter of dispute almost since the volume appeared. In the volume, Bruguière attributes the names and Latin diagnoses of species to C. H. Hwass (p. 598). Bruguière states that he himself wrote the descriptions and the "additional" synonymy (see Clench, 1942: 3). New specific names are published in the volume as, e.g. "*Conus catus* Hwass."

However, many subsequent writers (Lamarck, 1810; Dillwyn, 1817; Kiener, 1845–1850; Wood, 1856; Sowerby, 1857–1858; Schaufuss, 1869; Iredale, 1929; Tomlin, 1937; Cotton, 1945; Hanna and Strong, 1949; Hirase, 1954; and Kira, 1955) have cited such species as, e.g. "*Conus catus* Bruguière." Other

writers (Blainville, 1818; Reeve, 1843–1844; Adams and Adams, 1858; Weinkauff, 1874; Smith, 1879; Tryon, 1884; Fischer, 1887; von Martens and Thiele, 1903; Tinker, 1952; and Morris, 1952) have cited the names as they appear in Bruguière (1792). A third group of writers (Dautzenberg, 1937; Clench, 1942; Mermod, 1947; and Dodge, 1953) has cited such names as, e.g., "*Conus catus* Hwass in Bruguière."

Application of the *Règles* of the International Commission on Zoological Nomenclature (ICZN), and later provisions and clarifications of the *Règles*, does not lead to an unequivocal solution to this problem. In the decisions of the ICZN meeting in Paris in 1948, it was recommended (Bull. Zool. Nomencl. 4: 565–566, 1950) that "where in a book or paper written by one author (say author 'A') it is clearly stated that the description of one or more specified taxonomic units there named has been prepared exclusively by some other author (say author 'C'), the name or names in question are to be attributed to author 'C', not to author 'A'. The name of the taxonomic unit so described and named is to be cited by later authors as having been published by 'C in A'."

It is apparent from the remarks of Bruguière (1792: 598; see also Clench, 1942: 3) that the descriptions of the species were not prepared exclusively by Hwass, although the names and brief Latin diagnoses were. It is, however, the present author's opinion that Hwass's contribution is sufficient to justify attributing authorship of the names to him. This view is strengthened by the more recent further clarification of Article 21 (Copenhagen Decisions, 1953: 58–59), which states that "the rule set out on pages 565–566 of vol. 4 of the BULLETIN should be qualified in such a way as to make it clear that it applies only where the book or paper concerned contains a clear indication that not only the name in question was proposed by some author other than that by whom the book or paper was written but also that the indication, defini-

tion, or description on which, under Article 25, the availability of that name depends was written not by the author of the book or paper concerned but by the author to whom the name is there attributed."

For these reasons, the species of *Conus* referred to as, e.g. "*Conus catus* Hwass" in Bruguière (1792) are herein cited as, e.g. "*Conus catus* Hwass in Bruguière."

Museum Calonnianum. 1797. The names introduced in this publication were rejected in Opinion 51 of the ICZN (Smithsonian Publ. 2060, 1912: 116), but this decision has not been universally accepted. Of the names listed in the *Museum Calonnianum*, only three, all of which are synonyms, are pertinent to this paper. For the sake of completeness, they are listed in brackets in the synonymies. Authorship of the *Museum Calonnianum* is attributed to George Humphrey, following general acceptance. The problem is discussed in detail by Iredale (1937).

Museum Boltenianum. 1798. The names in this volume were accepted as nomenclatorially available in Opinion 96 of the ICZN (Smithsonian Misc. Coll., 73(4): 16-18, 1926), and their authorship was attributed to P. F. Röding in Direction 48 of the ICZN (Opinions and Declarations Rendered by the ICZN, 1: 255-264, 1956).

L. W. Dillwyn. *A Descriptive Catalogue of Recent Shells*. 1817. A number of species of *Conus* described by Chemnitz (1788, 1795) are listed in Dillwyn's catalogue. Since the specific names in Chemnitz (1788, 1795) have been rejected by Opinion 184 of the ICZN (Opinions and Declarations Rendered by the ICZN, 3: 27-35), these names became nomenclatorially available upon publication by Dillwyn (1817). (See also Bull. Zool. Nomencl., 4: 259-260, 1950.)

L. C. Kiener. *Spécies Général et Iconographie des Coquilles Vivantes*. 1845-1850. The names of species described in this work appear both on the plates and in the text. Hanna and Strong (1949) reproduce the summary of the collation of Sherborn and Woodward (1901:

218) which gives 1846 as the year of publication of the plates. This date, however, is erroneous, being presumably a typographical error. The correct date is 1845 as given in the body of the paper (Sherborn and Woodward, 1901: 217). Therefore, the names in Kiener's work should date from 1845 rather than from the dates on which they appeared in the text.³

Tomlin (1937) has given the most complete catalogue of the genus *Conus*. Some 2,700 names are listed, including both extant and fossil species. Earlier catalogues of Recent species are given by Reeve (1843-1849), Kiener (1845-1850), Sowerby (1857-1858), and Tryon (1884).

Earlier published lists of the species of *Conus* in Hawaii are those of Garrett (1878), Edmondson (1933, 1946), Tinker (1952, 1958), and Greene (1953). Extensive unpublished lists compiled by W. A. Bryan in 1919, and by E. H. Bryan, Jr. in 1956, have been made available to the writer by E. H. Bryan, Jr.

SYNONYMY

The synonymies consist of the first known publication of all known different names, authors, and combinations which have been applied to the species, listed chronologically. Subsequent references to the same name are not given, with the exception of errors and emendations, in order to conserve space. It is perhaps unfortunate that some of the references are to distributional lists and museum catalogues, which in many cases lack taxonomic information. These are included primarily because specific names first published in some of the museum catalogues have been recognized as available by the ICZN. Furthermore, in addition to their historical importance, such lists and catalogues are in some cases the source of errors which have been perpetuated in the subsequent literature.

Many specific names of *Conus* were introduced by authors who did not consistently use the binominal system. These names are

³ The author is grateful to Dr. Harald A. Rehder for having pointed out this discrepancy.

thus invalid (see Opinions and Declarations Rendered by the ICZN, 3: 27–35; 5: 265–279) and have not been included in the synonymies. Among the post-Linnean authors responsible for such names are Martini (1773), Chemnitz (1788, 1795), Meuschen (1778, 1787), and Martyn (1784–1792).

In cases of generic changes by subsequent authors, the name of the author of the species has been placed in parentheses throughout, whether or not this was done by the author of the generic change.

Described varieties of listed valid species are not included in synonymies. However, if the listed valid species itself has been described as a variety of another species, that entry is included in the synonymy.

In cases of published erroneous identification of specimens, the notation "(error)" follows the entry.

Genus *CONUS* Linné

Shell obconical, turbanate; whorls enrolled upon themselves, attenuated anteriorly. Spire usually short, smooth or coronate. Aperture elongate, narrow, effuse at the base, without teeth; outer lip smooth, sharp, with a sutural sinus:

Conus abbreviatus Reeve

Fig. 33 in Plate 2

Conus abbreviatus Reeve, 1843, *Conch. Icon.*, 1: pl. 16, sp. 86.

Conus abbreviatus Sowerby, 1857, *Thes. Conchyl.*, 3: 10 (as "*C. abbreviatus* Nuttall MS., Reeve C.I." on pl. 4, fig. 84).

Conus coronatus Dillwyn var. *abbreviatus*. Weinkauff, 1874, *Jahrb. Deutsch. Malak. Ges.*, 1: 250.

Conus miliaris Hwass var. *abbreviatus*. Tryon, 1884, *Man. Conch.*, 1: 22, pl. 5, fig. 89.

Stephanoconus abbreviatus (Reeve). Kaicher, 1956, *Indo-Pacific Sea Shells*, Sect. 5, pl. 2, fig. 4.

DESCRIPTION: Shell small but sturdy. Body whorl striate, the striae as raised ridges near

the base, impressed and widely spaced elsewhere. Aperture fairly narrow, flaring somewhat towards the anterior, or basal end. Base attenuated. Shoulder coronate; spire depressed, coronate, striate. Color bluish gray, with pale flesh-colored transverse bands in the middle of the body whorl and at the shoulder; with rows of rather distantly spaced small brown dots encircling the body whorl. Aperture purplish brown within, with a light median band. Periostracum thin, yellow, translucent. In life, foot pale brown; siphon pale brown, tinged with pink.

LENGTH: To 60 mm., but usually smaller.

TYPE LOCALITY: Oahu.

REMARKS: It is believed that this species is endemic to the Hawaiian archipelago. It is known from Midway Island and all of the main islands, where it is usually rather common on marine benches. Larger specimens are found on sandy substrata of coral reef platforms.

Conus miliaris Hwass and *C. coronatus* Gmelin, neither of which occurs in Hawaii, are the most closely related species. *C. abbreviatus* may be distinguished from both by the regular arrangement and small size of the brown dots, by the characteristic bluish-gray ground color, and by the absence of irregular longitudinal white flecks (as in *C. miliaris*) or brown blotches (as in *C. coronatus*).

Pleistocene fossils of *C. abbreviatus* are known from Oahu (Ostergaard, 1928), Maui, and Molokai (Ostergaard, 1939).

Conus acutangulus Lamarck

Fig. 37 in Plate 2

Conus acutangulus Lamarck, 1810, *Ann. Mus. Hist. Nat. Paris*, 15: 286.

Leptoconus acutangulus. Adams and Adams, 1853, *Gen. Rec. Moll.*, 1: 251.

Conus acutangulatus Sowerby, 1857, *Thes. Conchyl.*, 3: 11.

(?) *Conus crebrisulcus* Sowerby, 1857, *Thes. Conchyl.*, 3: 21, pl. 14, fig. 321.

Conus turriculatus Sowerby, 1866, Thes. Conchyl., 3: 328, pl. 27, figs. 643, 644.

Conus gemmulatus Sowerby, 1870, Proc. Zool. Soc. Lond., 1870: 257, pl. 22, fig. 8.

Conus acutangulus Bruguière. Paetel, 1883, Catal. Conch.-Samml. Paetel, p. 50.

Conus acutangulus Hwass. Tryon, 1884, Man. Conch., 6: 76.

Conus acutanculus Friedberg, 1911, Rozprawy Wiadomości Muzeum Imienia Dzieduszyckich (Moll. Mioc. Poloniae), 14: 47.

Conus eugrammatus Bartsch and Rehder, 1943, Proc. Biol. Soc. Wash., 56: 85.

Conasprella acutangulus (Lamarck). Cotton, 1945, Rec. South Austral. Mus., 8: 272.

Conus eugrammatus Dall, Bartsch and Rehder. Greene, 1953, Ann. Rept. Amer. Malacol. Union, Bull. 20: 28.

Asprella acutangulus (Lamarck). Kuroda, 1956, Venus: Jap. Jour. Mal., 19: 88.

DESCRIPTION: Shell small, rather thin. Body whorl elongate, bearing rather distantly and irregularly spaced incised spiral lines marked by small punctures. Aperture narrow, outer lip protracted. Shoulder angular, ridged; spire elevated, turreted, concave, striate, compris-

ing at least one third of the total shell length; apex sharp. Early whorls smooth, succeeding whorls with slender protracting curved axial riblets which fuse to form strong nodules at the shoulder, the nodules becoming less conspicuous on the latest whorls. Color of body whorl white to pale buff, marked with interrupted broad brown spiral bands either side of the center. Rows of brown dots between the striae mark the light area between the brown bands. Spire marked by distantly spaced rather regular broad brown spots. Periostracum grayish white, bearing lamellae on the fine riblets of the spire.

LENGTH: 30 mm.

TYPE LOCALITY: "Mers des grandes Indes."

REMARKS: Specimens of *C. acutangulus* have been collected in Hawaii by dredging in comparative shallow water and to a depth of 200 fathoms.

Conus bullatus Linné

Fig. 1

Conus bullatus Linné, 1758, Syst. Nat., ed. 10, p. 717.

PLATE 1

References are given to the shells figured. The dimensions given are shell length \times maximum diameter.

FIG. 1. *Conus distans* Hwass in Bruguière. 75 \times 43 mm. Off Rabbit (Manana) Island, off Oahu. USNM coll., No. 484738.

FIG. 2. *Conus textile* Linné. 80 \times 44 mm. Waikiki, Oahu. C. E. Cutress coll.

FIG. 3. *Conus pennaceus* Born. 64 \times 35 mm. Keaukaha, Hilo, Hawaii. USNM coll., No. 338584.

FIG. 4. *Conus quercinus* Solander. 80 \times 49 mm. Honolulu Harbor Channel, Oahu. USNM coll., No. 338584.

FIG. 5. *Conus striatus* Linné. 107 \times 53 mm. Waikiki, Oahu. C. E. Cutress coll.

FIG. 6. *Conus miles* Linné. 67 \times 39 mm. Waikiki, Oahu. C. E. Cutress coll.

FIG. 7. *Conus imperialis* Linné. 69 \times 36 mm. Lahaina, Maui. USNM coll., No. 484735.

FIG. 8. *Conus spiceri* Bartsch & Rehder. 113 \times 62 mm. Midway Island. USNM coll., No. 523700.

FIG. 9. *Conus marmoreus* Linné. 96 \times 54 mm. Honolulu Harbor entrance, Oahu, 5-8 fathoms. USNM coll., No. 338163.

FIG. 10. *Conus leopardus* (Röding). 143 \times 86 mm. Waimea Bay, Oahu. C. E. Cutress coll.

FIG. 11. *Conus vexillum* Gmelin. 88 \times 54 mm. Kahala, Oahu. USNM coll., No. 338510.

FIG. 12. *Conus pulicarius* Hwass in Bruguière. 48 \times 27 mm. Honolulu, Oahu. USNM coll., No. 338195.

FIG. 13. *Conus smirna* Bartsch & Rehder. Holotype. 61 \times 23 mm. off Lanai, 257-312 fathoms. USNM coll., No. 173226.

FIG. 14. *Conus vitulinus* Hwass in Bruguière. 56 \times 31 mm. Keokey, Hawaii. USNM coll., No. 338549.

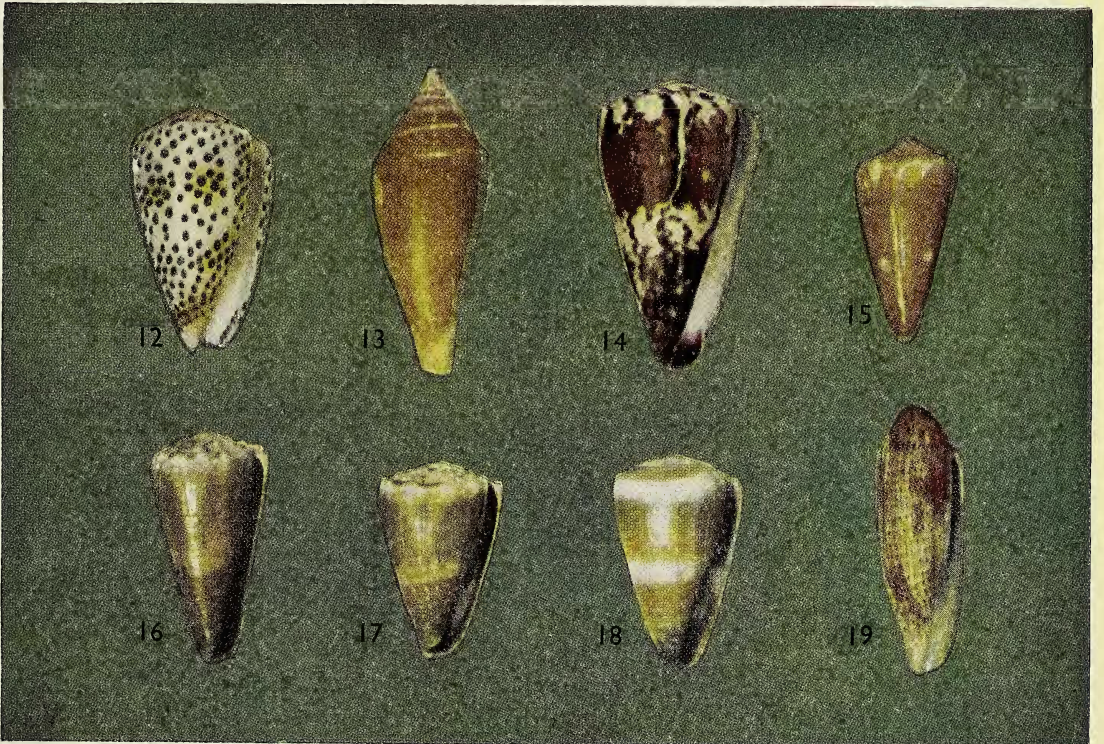
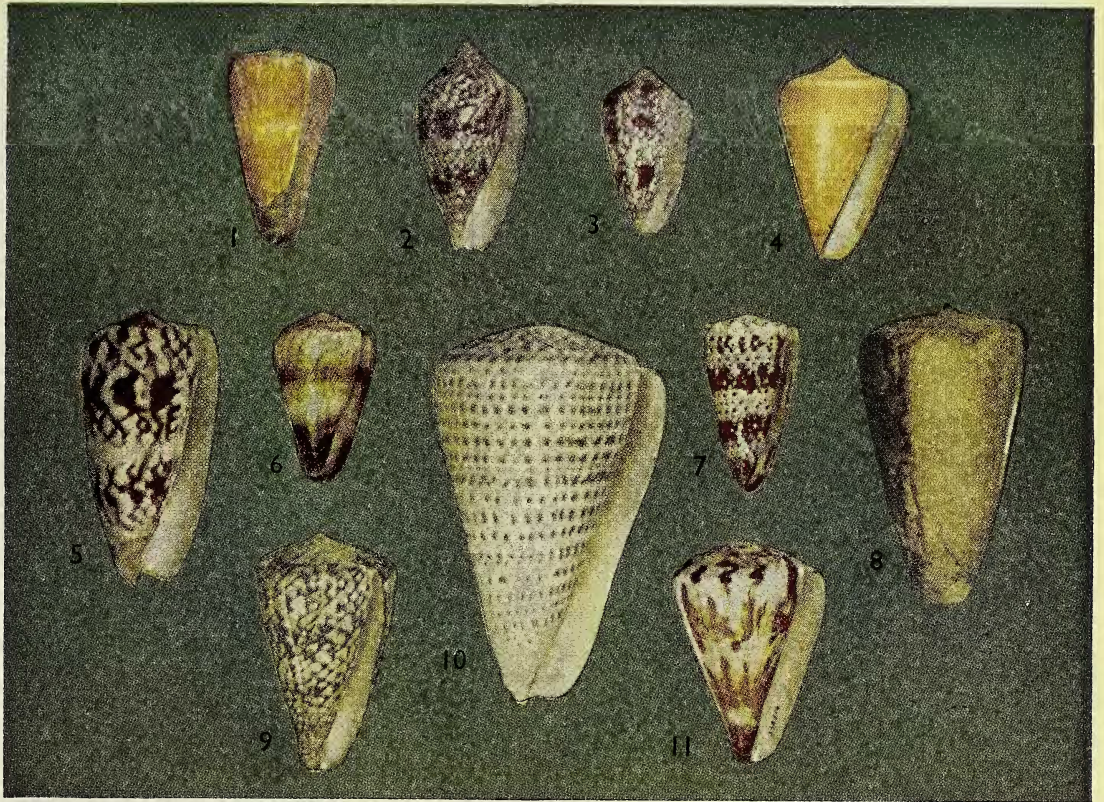
FIG. 15. *Conus litoglyphus* Hwass in Bruguière. 41 \times 19 mm. Honolulu Harbor entrance, Oahu, 5-8 fathoms. USNM coll., No. 338538.

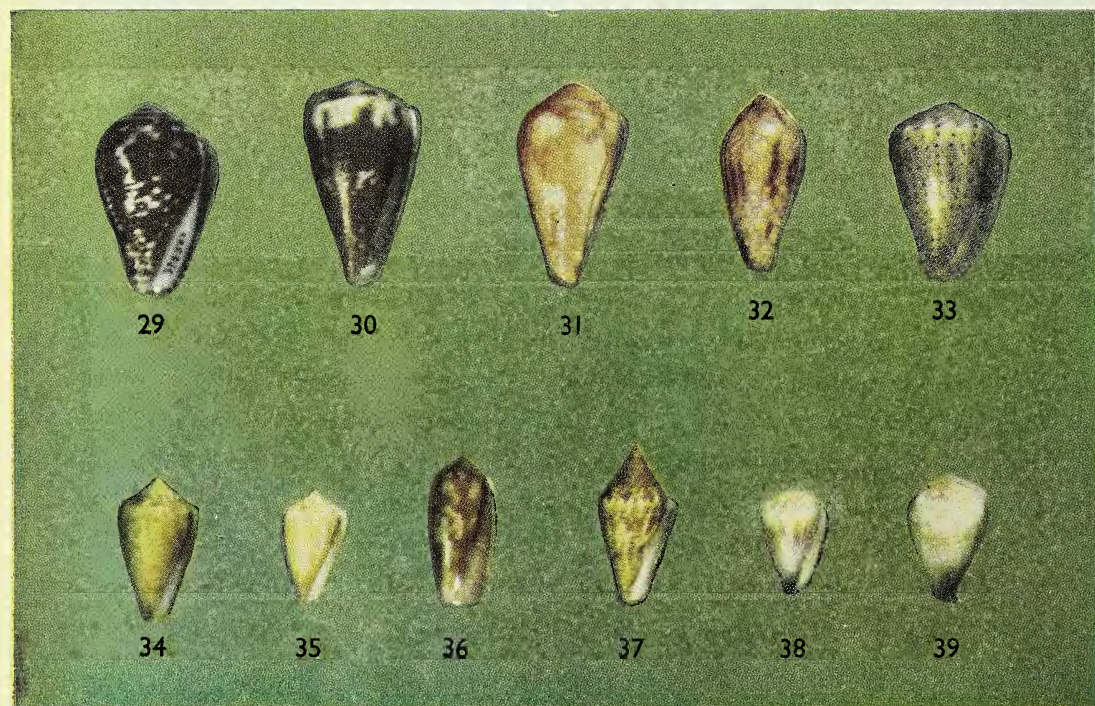
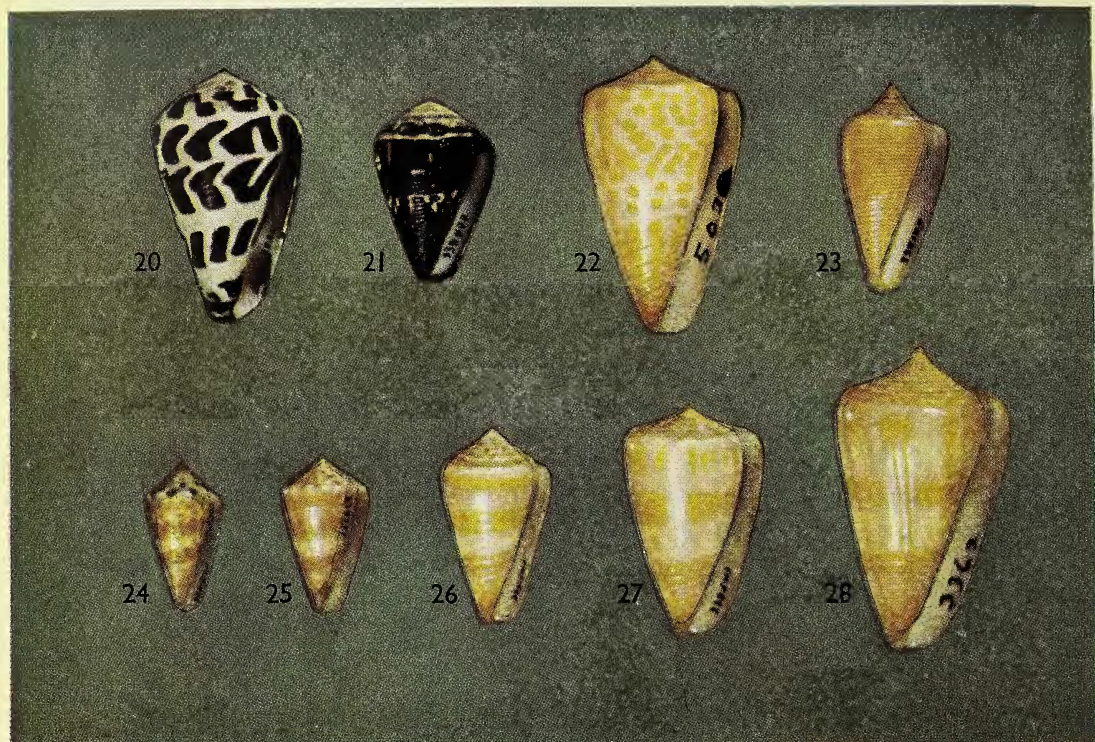
FIG. 16. *Conus moreleti* Crosse. 46 \times 23 mm. Kailua, Oahu, 12-15 feet. USNM coll., No. 484249.

FIG. 17. *Conus lividus* Hwass in Bruguière. 39 \times 23 mm. Honokowai, Maui. USNM coll., No. 338531.

FIG. 18. *Conus flavidus* Lamarck. 42 \times 25 mm. Honokowai, Maui. USNM coll., No. 338522.

FIG. 19. *Conus nussatella* Linné. 53 \times 17 mm. Kuhio Bay, Hilo, Hawaii. USNM coll., No. 338577.





Conus nubecula Gmelin, 1791, Syst. Nat., ed. 13, p. 3396.

Cucullus nubecula (Gmelin). Röding, 1798, Mus. Boltenianum, p. 46.

Cucullus parvus Röding, 1798, Mus. Boltenianum, p. 46.

Cucullus laganum Röding, 1798, Mus. Boltenianum, p. 51.

Conus bullatus Lamarck. Sowerby, 1833, Conch. Illus., p. 2, pt. 29, fig. 23.

Textilia bullatus. Swainson, 1840, Treat. Mal., p. 312.

Leptoconus bullatus (Linné). Adams and Adams, 1853, Gen. Rec. Moll., 1: 253.

Textilia bullata (Linné). Cotton, 1945, Rec. South Austral. Mus., 8: 261.

DESCRIPTION: Shell rather thick but not heavy, ovate-oblong, the maximum diameter not at the shoulder but about one third of the distance from shoulder to base. Body whorl glossy, with impressed, rather widely spaced transverse striae basally. Shoulder rounded, smooth; spire obsoletely striate, canaliculate. Ground color white or pale pink, clouded with orange brown subtrigonal markings often fused to form three broad, rather poorly defined transverse bands, separated by areas of sparser, irregularly placed similar

markings. Spire marked irregularly with orange brown and pink or pinkish white. Interior of aperture pinkish orange. Periostracum thin.

LENGTH: The most recently collected specimen from Hawaii (see below) measures 62 × 29 mm.

TYPE LOCALITY: None.

REMARKS: Very few specimens of *Conus bullatus* are known from the Hawaiian Islands. A single shell in excellent condition was dredged off Nanakuli, Oahu, but whether or not it was alive is not known (D. Thaanum, *in litt.*). In November, 1957, a living specimen (Fig. 1) was collected half-buried in sand at a depth of 100 feet off Diamond Head, Oahu (C. S. Weaver, *in litt.*). At least two other specimens are believed to have been collected in Hawaii, but it has not been possible to verify the reports. In addition, a number of dead shells have been collected (K. W. Greene, *in litt.*; L. Brand, verbal communication).

Conus capitaneus Linné

Fig. 2

Conus capitaneus Linné, 1758, Syst. Nat., ed. 10, p. 713.

PLATE 2

References are given to the shells figured. The dimensions given are shell length × maximum diameter.

FIG. 20. *Conus ebraeus* Linné. 39 × 23 mm. Hilo, Hawaii. USNM coll., No. 338209.

FIG. 21. *Conus chaldaeus* (Röding). 29 × 18 mm. Hilo, Hawaii. USNM coll., No. 338477.

FIG. 22. *Conus tessulatus* Born. 42 × 25 mm. "Sandwich Is." USNM coll., No. 5038. A faded specimen.

FIG. 23. *Conus quercinus* Solander. 33 × 16 mm. Off Kaanapali, Maui, 4–12 fathoms. USNM coll., No. 338187. Juvenile specimen, showing the characteristic high spire.

FIGS. 24–28. *Conus saturatus* Reeve, showing changes in color pattern with increase in size. FIG. 24. 23 × 11 mm. Off Launiupoko Camp, Maui, 4–12 fathoms. USNM coll., No. 338546. FIG. 25. 25 × 13 mm. Off Mt. Lihau, Maui, 4–12 fathoms. USNM coll., No. 338547. FIG. 26. 32 × 17 mm. USNM coll., No. 338546. FIG. 27. 37 × 21 mm. Honolulu Harbor entrance, Oahu, 5–8 fathoms. USNM coll., No. 338541. FIG. 28. 48 × 27 mm. North Island, Pearl and Hermes Reef. Mrs. J. Bromley coll., No. 3363.

FIG. 29. *Conus catus* Hwass *in* Bruguière. 29 × 18 mm. Honokowai, Maui. USNM coll., No. 338561.

FIG. 30. *Conus rattus* Hwass *in* Bruguière. 30 × 17 mm. Honolulu, Oahu. USNM coll., No. 338516.

FIG. 31. *Conus pertusus* Hwass *in* Bruguière. 30 × 15 mm. Locality unknown. USNM coll., No. 18522.

FIG. 32. *Conus retifer* Menke. Midway Island. USNM coll., No. 524591. A faded specimen.

FIG. 33. *Conus abbreviatus* Reeve. 26 × 17 mm. Honokowai, Maui. USNM coll., No. 338488.

FIG. 34. *Conus circumactis* Iredale. 22 × 11 mm. Off Lanai, 179–253 fathoms. (Holotype of *Conus hammatus* Bartsch and Rehder). USNM coll., No. 173225. Juvenile.

FIG. 35. *Conus circumactis* Iredale. 17 × 9 mm. USNM coll. Juvenile.

FIG. 36. *Conus obscurus* Sowerby. 23 × 9 mm. Off Waikiki, Oahu, 20 feet. USNM coll., No. 484740.

FIG. 37. *Conus acutangulus* Lamarck. 24 × 10 mm. Honolulu Harbor entrance, Oahu, 6–8 fathoms. USNM coll., No. 338564.

FIGS. 38–39. *Conus sponsalis* Hwass *in* Bruguière. Kauai. USNM coll. FIG. 38. 15 × 9 mm. FIG. 39. 18 × 11 mm.

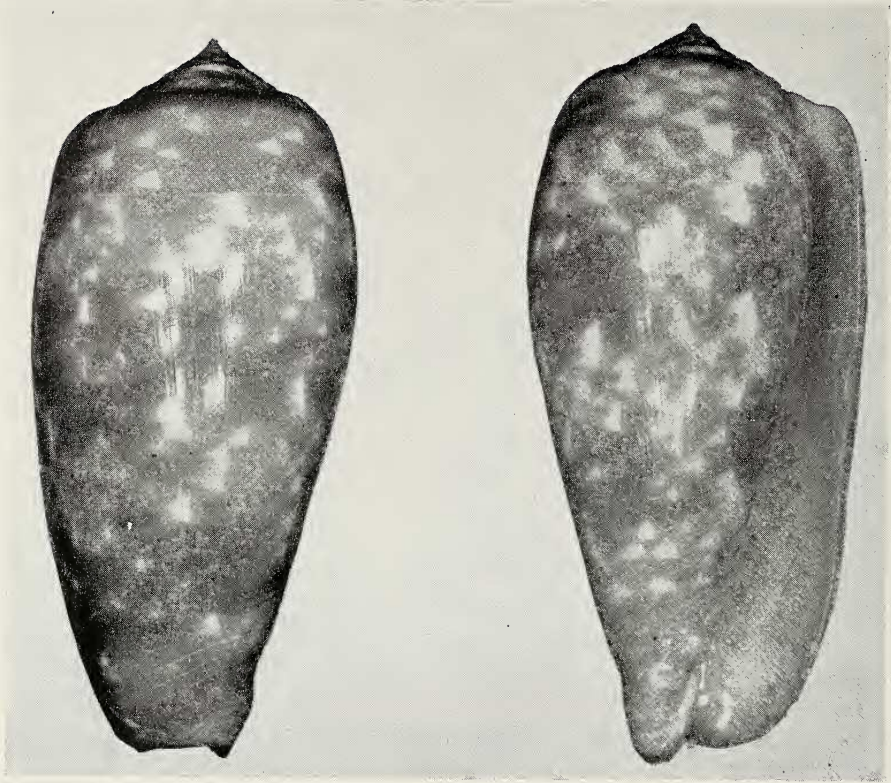


FIG. 1. *Conus bullatus* Linné, 62 × 29 mm. Collected off Diamond Head, Oahu, 17 fathoms. Shell in collection of C. S. Weaver. Photographs by the author.

Conus classarius Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 705, pl. 335, fig. 7. [*Conus venator* Humphrey, 1797, Mus. Calonianum, p. 11.]

[*Conus agasus* Humphrey, 1797, Mus. Calonianum, p. 11.]

Cucullus capitaneus (Gmelin). Röding, 1798, Mus. Boltenianum, p. 43.

Conus classarius Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 267.

Conus chemnitzii Dillwyn, 1817, Descr. Cat. Rec. Shells, 1: 363.

Conus capitaneus Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 172.

Leptoconus capitaneus (Linné). Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

Conus ceciliae Crosse, 1858, Jour. Conchyl., 7: 381, pl. 14, fig. 5.

Rhizoconus capitaneus (Linné). Frauenfeld, 1869, Verh. Zool.-Bot. Ges. Wien, 19: 863.

Conus chemnitzii Dillwyn. Dautzenberg, 1937, Mem. Mus. Roy. Hist. Nat. Belg., 2(18): 171.

Lithoconus capitaneus (Linné). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 4, fig. 9.

DESCRIPTION: Shell of moderate thickness; body whorl encircled by finely punctate striae on the basal half, the striae more distinct and separated by low ridges basally; aperture rather narrow, the sides parallel. Shoulder angular, smooth; spire rather low, obtuse, striate; apex pointed. Color of body whorl variable, yellow or olive yellow to orange brown or olive brown, encircled by several dark brown dotted lines and two broad white bands, interrupted by dark brown blotches, at the shoulder and centrally on the body whorl. The white bands may also be crossed by closely spaced longitudinal wavy brown

lines. Young individuals may lack the two white bands. Spire tessellated with alternate brown and white blotches, continuing to form band on body whorl at shoulder. Outer lip thin; aperture violet within. Periostracum rather thin but opaque, encircled by raised transverse ridges.

LENGTH: The only two specimens known from the Hawaiian Islands (Fig. 2) measure 31×21 mm. and 19.5×11.5 mm.

TYPE LOCALITY: Asia.

REMARKS: This species was not known to occur in the Hawaiian area until the collection of a living specimen (Fig. 2, right) by Mrs. A. M. Harrison at a depth of 15–20 feet off Nanakuli, Oahu, in April, 1958. A second, smaller specimen (Fig. 2, left) was collected by Mr. A. M. Harrison at a depth of 35 feet near Kaena Pt., Oahu, on 31 August 1958.

Conus catus Hwass in Bruguière

Fig. 29 in Plate 2

Conus catus Hwass in Bruguière, 1792, Enc.

Meth. Vers, 1: 707, pl. 332, figs. 3, 4, 7.

Conus leoninus var. δ Gmelin, 1791, Syst. Nat., ed. 13, p. 3387.

Cucullus nubilus Röding, 1798, Mus. Boltenianum, p. 46.

Conus nubilus (Bolten). Link, 1807, Beschreib. Nat.-Samml. Univ. Rostock, Abt. 3, p. 105.

Conus catus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 285.

Conus discrepans Sowerby, 1833, Conch. Illus., p. 2, pt. 29, fig. 28.

Conus catus Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 173.

Leptoconus catus (Hwass). Adams and Adams, 1853, Gen. Rec. Moll., 1: 253.

(?) *Conus purus* Pease, 1862, Proc. Zool. Soc. Lond., p. 279.

Chelyconus catus (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 241.

Chelyconus catus (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 6, fig. 10.

DESCRIPTION: Shell stout, solid, bulbous. Body whorl striate, the striae raised, rounded, usually obsolete near the shoulder, and granular near the base. Aperture rather broad, the sides almost parallel. Shoulder rounded, smooth; spire obtuse, deeply striate. Apex sharp, rose-colored, but often eroded. Color of body whorl and spire brown with irregular white flecks or splotches. Aperture white with brown margin. Periostracum thin, yellow, translucent. In life, foot mottled brown on buff. "Pale cinereous, varied with delicate brown mottlings, which are most conspicuous on the muzzle" (Garrett, 1878).

LENGTH: To 40 mm.

TYPE LOCALITY: Several localities are given with the original description, the first two of which, "Saint-Domingue" and Martinique, are almost certainly in error. The species described as *Conus catus* is restricted to the Indo-West Pacific region although it resembles *Conus ranunculus* Hwass in Bruguière, a western Atlantic species.

REMARKS: *Conus catus* is less variable with respect to shell characteristics in Hawaii than in other parts of the Pacific and Indian oceans. It occurs intertidally on benches and rocky shores and subtidally as well. Pleistocene fossils are known from Oahu (Ostergaard, 1928).

Conus chaldaeus (Röding)

Fig. 21 in Plate 2

Conus princeps Linné. Born, 1778, Ind. Rer. Nat. Mus. Caes. Vind., p. 134. (error).

Conus princeps var. β . Gmelin, 1791, Syst. Nat., ed. 13, p. 3378.

Conus ebraeus Linné var. E. Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 619, pl. 321, figs. 1, 7, 8.

Cucullus chaldaeus Röding, 1798, Mus. Boltenianum, p. 42.

Conus chaldaeus (Bolten). Link, 1807, Beschreib. Nat.-Samml. Univ. Rostock, Abt. 3, p. 106.

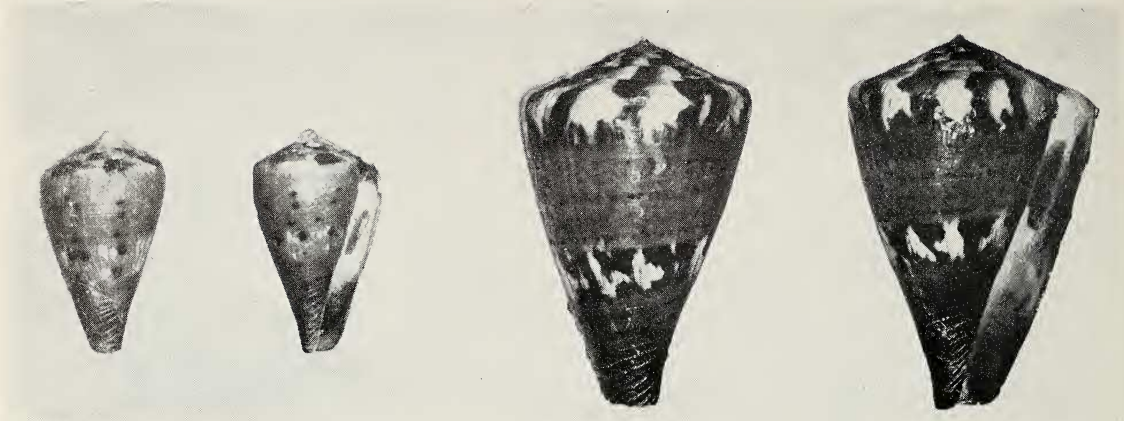


FIG. 2. *Conus capitaneus* Linné. Left, 19.5 × 11.5 mm. Specimen collected by A. M. Harrison near Kaena Pt., Oahu, 6 fathoms. Right, 31 × 21 mm. Specimen collected by Mrs. A. M. Harrison near Nanakuli, Oahu, 3 fathoms. Photographs by the author.

Conus vermiculatus Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 34.

Conus ebraeus Linné var. C. Dillwyn, 1817, Descr. Cat. Rec. Shells, p. 399.

Conus ebraeus Linné var. D. Dillwyn, 1817, Descr. Cat. Rec. Shells, p. 399.

Conus hebraeus Linné var. β. Reeve, 1843, Conchol. Icon., 1: pl. 19, fig. 104a.

Conus hebraeus Linné var. *vermiculatus* Lamarck. Kiener, 1846, Spéc. Gén. Icon. Coq. Viv., 2: 46, pl. 8, fig. 3.

Conus ebraeus Linné var. *vermiculatus* Hwass. Weinkauff, 1874, Jahrb. Deutsch. Malak. Ges., 1: 249.

Conus ebraeus Linné var. *vermiculatus* Lamarck: Crosse and Marie, 1874, Jour. Conchyl., 22: 340.

Conus hebraeus Linné var. *vermiculatus* Hwass. Kobelt, 1878, Illus. Conchyl., p. 92.

Conus vermiculatus Bruguière. Fischer, 1891, Bull. Soc. Hist. Nat. Autun, 4: 132.

Conus ebraeus Linné var. *vermiculata* Lamarck. Couturier, 1907, Jour. Conchyl., 55: 126.

Cucullus chaldaeus Bolten. Iredale, 1929, Mem. Queensl. Mus., 9: 282.

Virroconus chaldaeus (Bolten). Cotton, 1945, Rec. Austral. Mus., 8: 236.

Conus chaldeus (Röding). Tinker, 1952, Pacific Sea Shells, p. 44.

Conus chaldens (Röding). Dietrich and Morris, 1953, Nautilus, 67: 17, pl. 4, fig. 19.

Virroconus chaldeus (Röding). Kira, 1955, Coloured Illus. Shells Japan, p. 72.

Stephanoconus chaldeus (Röding). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, fig. 10.

Conus ebraeus chaldaeus Röding. Hertlein and Emerson, 1957, Amer. Mus. Novit., No. 1859: 3.

DESCRIPTION: Shell rather small but extremely thick and sturdy. Body whorl transversely striate, the striae obsolete tuberculate near the base, becoming strongly so near the shoulder; aperture narrow. Shoulder coronate; spire moderately elevated, tuberculate, striate; apex often eroded. Color mostly black, with narrow, irregular, usually interrupted white bands at the shoulder and centrally on the body whorl, the black areas also interrupted by intermittent vertical white streaks. Aperture bluish white, the external color pattern visible at the outer lip. Periostracum rather thin, yellow, translucent. In life, foot black, with a broad central longitudinal tan stripe on the sole. Siphon and rostrum black, tipped with red.

LENGTH: Usually less than 40 mm. A specimen collected by the author at Waikiki, Oahu, measures 44 mm.

TYPE LOCALITY: None.

REMARKS: This species is closely related to *Conus ebraeus* and is regarded as a variety of that species by some recent workers (e.g. Dodge, 1953). It differs from *C. ebraeus* in being generally smaller, having a tuberculate surface, and having the black flammules confluent so as to cover most of the shell. The two species are sympatric over a wide range. Hawaiian specimens are easily distinguishable. In other areas, the two species tend to approach each other more closely morphologically but do not intergrade. Lamarck's (1810) statement that the two species are constantly distinct is correct.

C. chaldaeus occurs most commonly near the outer edge of marine benches. Pleistocene fossils are known from Oahu (Ostergaard, 1928).

Conus circumactis Iredale

Figs. 34 and 35 in Plate 2; Fig. 3

Conus cinctus Swainson, 1822, Zool. Illus., ser. 1, 2: pl. 110. (non *cinctus* Bosc, 1801.)

Conus pulchellus Swainson, 1822, Zool. Illus., ser. 1, 2: pl. 114. (non *pulchellus* Röding, 1798.)

Rhizoconus pulchellus (Swainson). Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

(?) *Conus connectens* A. Adams, 1854, Proc. Zool. Soc. Lond., 1854: 136.

Conus circumactis Iredale, 1929, Mem. Queensl. Mus., 9: 281.

Conus hammatus Bartsch and Rehder, 1943, Proc. Biol. Soc. Wash., 56: 86.

Dauciconus circumactis (Iredale). Cotton, 1945, Rec. South Austral. Mus., 8: 246.

Conus hammatus Dall, Bartsch and Rehder. Greene, 1953, Ann. Rept. Amer. Malacol. Union, Bull. 20: 28.

Leptoconus circumactis (Iredale). Kuroda, 1956, Venus: Jap. Jour. Mal., 19: 73.

DESCRIPTION: Shell rather thin; body whorl slightly concave near the base on the left side, spirally striate with the striae obsolete and impressed toward the shoulder but stronger and with widely spaced low knobs basally. Aperture narrow, widening slightly basally; outer lip thin. Shoulder angular, smooth or



FIG. 3. *Conus circumactis* Iredale. Specimens dredged by C. A. Allen off southern shore of Oahu, 8-60 fathoms. Left, 21 × 12 mm.; center, 25 × 13 mm.; right, 34 × 18 mm. Photographs by M. Miyamoto.

extremely obsoletely coronate. Spire low; apex nipplelike, especially in young specimens; whorls finely striate, separated by a deeply impressed suture. Color of body whorl pale yellow or yellowish brown, with large white blotches forming a band at the shoulder and another at the middle; body whorl also encircled by narrow brown lines, which are usually interrupted to form dots and dashes; base violet or pink; interior of aperture bluish or pinkish white. Spire white or pinkish white, sparsely maculated with brown. Periostracum rather thick, yellowish brown and opaque in young specimens, yellow and somewhat translucent in older individuals.

LENGTH: 35 mm.

TYPE LOCALITY: Amboina.

REMARKS: All specimens of *C. circumactis* known from the Hawaiian Islands have been collected by dredging. The holotype of *C. hammatus* Bartsch and Rehder, here considered the juvenile of *C. circumactis*, was dredged off Kauai in about 200 fathoms. C. A. Allen collected thirteen specimens from depths of 8–60 fathoms off the southern shore of Oahu.

Of the other species of *Conus* in Hawaii, *C. vitulinus* is most closely related to *C. circumactis*. The latter can be distinguished by its pale ground color, pink or violet base, and yellowish brown periostracum. *C. circumactis* can be distinguished from *C. litoglyphus* by the narrow interrupted transverse brown lines and the pink or violet base in the former.

Conus distans Hwass in Bruguière

Fig. 1 in Plate 1

Conus distans Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 634, pl. 321, fig. 11.

Conus distans Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 38.

Virroconus distans (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 254.

Rhizoconus distans (Bruguière). Kira, 1955, Coloured Illus. Shells Japan, p. 75.

Virgiconus distans (Bruguière). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 291.

Stephanoconus distans (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, fig. 16.

DESCRIPTION: Shell large, elongate, slightly concave in profile. Body whorl smooth or encircled with obsolete impressed lines; aperture narrow, the sides parallel. Shoulder coronate; spire short, coronated with obtuse rounded tubercles. Color of body whorl yellowish tan, obsoletely banded with white or pale bluish white at the center and near the shoulder. Tubercles of the spire white, depressed areas between them dark brown. A purplish brown stain usually present near the base. Interior of aperture light violet with a lighter central band, darker violet at the base. The violet of the interior is deeper in juvenile specimens, which are generally more colorful. Periostracum thick, olive green, with transverse rows of tufted ridges on body whorl. In life, foot brown; siphon light tan, mottled with brown; rostrum dark brown, tipped with yellow; tentacles light brown; penis orange.

LENGTH: 120 mm.

TYPE LOCALITY: New Zealand. In error (see Wilkins, 1955: 106).

REMARKS: *C. distans* occurs chiefly at the outer areas of reef platforms and in depths of one or more fathoms.

Conus ebraeus Linné

Fig. 20 in Plate 2

Conus ebraeus Linné, 1758, Syst. Nat., ed. 10, p. 715.

Conus hebraeus Linné. Born, 1778, Ind. Rer. Nat. Mus. Caes. Vind., p. 142.

Cucullus ebraeus (Gmelin). Röding, 1798, Mus. Boltenianum, p. 42.

Conus quadratus Perry, 1811, Conchology, pl. 24, fig. 5. (non *quadratus* Röding, 1798.)

Conus hebraeus Hwass. Blainville, 1818, Dict. Sci. Nat., 10: 249.

Conus hebraeus Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 170.

Conus hebreus. Montrouzier, 1856, Ann. Soc. Imp. Agr. Lyon, 8: 416.

Coronaxis hebraeus (Linné). Frauenfeld, 1869, Verh. Zool.-Bot. Ges. Wien, 19: 863.

Virroconus ebraeus (Linné). Iredale, 1930, Mem. Queensl. Mus., 10: 80.

Stephanoconus ebraeus (Linné). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, fig. 9.

DESCRIPTION: Shell solid; body whorl smooth, becoming encircled with obsolete raised ridges toward the base; outer lip of aperture flaring slightly basally. Shoulder coronate, often obsoletely so; spire of moderate height, often somewhat eroded, indistinctly coronate. Color white with usually three rows of large angular rhomboidal black flammules, with another row encircling the shoulder. Aperture with clouded bands corresponding with the exterior markings. Periostracum thin, yellow, translucent. In life, foot black, with a broad longitudinal central buff stripe on the sole. Siphon and rostrum black, tipped with a narrow red margin.

LENGTH: This species attains greater length in the Hawaiian Islands than in other parts of its extensive range. Specimens exceeding 50 mm. are often found. A specimen collected by the author at Diamond Head, Oahu, measures 56 mm. in length.

TYPE LOCALITY: India.

REMARKS: One of the most abundant species of *Conus* in the Hawaiian Islands, *C. ebraeus* is the dominant species on intertidal benches and occurs also on reef platforms. Pleistocene fossils are known from Oahu (Ostergaard, 1928).

Conus flavidus Lamarck

Fig. 18 in Plate 1

Conus flavidus Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 265.

Conus virgo Linné var. Dillwyn, 1817, Descr. Cat. Rec. Shells, 1: 362.

Dendroconus flavidus (Lamarck). Adams and Adams, 1853, Gen. Rec. Moll., 1: 250.

Conus neglectus Pease, 1860, Proc. Zool. Soc. Lond., pt. 28: 398. (non *neglectus* A. Adams, 1853.)

Conus flavidus Bruguière. Issel, 1869, Malacologia del Mar Rosso, p. 143.

Lithoconus flavidus (Lamarck). Brazier, 1877, Proc. Linn. Soc. New South Wales, 1: 288.

Lithoconus peasei Brazier, 1877, Proc. Linn. Soc. New South Wales, 1: 288.

Conus lividus Hwass var. *flavidus* Lamarck. Smith, 1879, Phil. Trans. Roy. Soc. Lond., 168 (extra volume): 477.

Virgiconus flavidus (Lamarck). Cotton, 1945, Rec. South Austral. Mus., 8: 254.

DESCRIPTION: Shell thick and heavy. Body whorl transversely striate, the striae more pronounced and raised toward the base; aperture narrow. Shoulder rather square, smooth; spire low, striate. Color of body whorl usually olivaceous or yellowish brown banded with white and/or bluish white at the shoulder and below the middle. Base stained dark violet. Aperture violet, with a light central band and yellow margin. Periostracum gray, transversely ridged in young specimens, smooth in older individuals. In life, upper surface of foot reddish brown, mottled with brown; remainder of foot and rostrum light yellowish brown mottled with darker brown; tip of siphon yellow, followed proximally by black and yellow bands; remainder of siphon yellow mottled with black. Tentacles white to yellow.

LENGTH: 50 mm.

TYPE LOCALITY: None.

REMARKS: *C. flavidus* is one of the commonest species of *Conus* on Hawaiian coral reefs. Pleistocene fossils have been collected on Oahu by Ostergaard (1928) and the writer and on Molokai by Ostergaard (1939).

Conus imperialis Linné

Fig. 7 in Plate 1

Conus imperialis Linné, 1758, Syst. Nat., ed. 10, p. 712.

Conus fuscatus Born, 1778, Ind. Rer. Nat. Mus. Caes. Vind., p. 126.

Cucullus imperialis (Gmelin). Röding, 1798, Mus. Boltenianum, p. 37.

Cucullus corona-ducalis Röding, 1798, Mus. Boltenianum, p. 38.

Cucullus regius Röding, 1798, Mus. Boltenianum, p. 38. (non *regius* Gmelin, 1791.)

Conus viridulus Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 31.

Conus imperialis Lamarck. Sowerby, 1839, Conch. Illus., p. 4, pt. 157-158, figs. 128, 129.

Conus fuscatus Lamarck. Sowerby, 1839, Conch. Illus., p. 4, pt. 157-158, figs. 130, 131.

Conus viridulus Linné. Adams and Adams, 1853, Gen. Rec. Moll., 1: 247.

Conus queketti Smith, 1906, Ann. Natal Govt. Mus., 1: 22, pl. 7, fig. 1.

Cucullus imperialis (Linné). Kira, 1955, Coloured Illus. Shells Japan, p. 72.

Rhombus imperialis (Linné). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 289.

DESCRIPTION: Shell large and sturdy, body whorl elongate, striate basally; outer lip thin. Shoulder coronate; spire low, strongly coronate. Ground color of shell white, with numerous interrupted light and dark brown bands on the spire as well as on the body whorl. Two broad yellowish brown bands encircle the body whorl. The band nearer the shoulder is broader. Both bands contain several narrow revolving dark brown lines interrupted by white. Color of base pale blue, often as narrow interrupted revolving lines. Base of aperture stained with a dark purple marginal band. Periostracum thin, yellow, translucent, but often obscured by epizooic coralline algae in nature. In life, exposed soft parts red, speckled with black.

LENGTH: 90 mm.

TYPE LOCALITY: None.

REMARKS: *C. imperialis* occurs on reef platforms and to a depth of at least 30 fathoms. Pleistocene fossils are known from Oahu (Ostergaard, 1928).

Conus leopardus (Röding)

Fig. 10 in Plate 1

(?) *Conus litteratus* Linné var. β Born, 1778,

Ind. Rer. Nat. Mus. Caes. Vind., p. 128.

Conus litteratus Linné var. β Born, 1780, Test. Mus. Caes. Vind., p. 149.

Conus litteratus Linné var. D Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 638, pl. 324, fig. 4.

Conus litteratus Linné var. G Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 638, pl. 324, fig. 3.

Conus litteratus Linné var. I Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 638, pl. 323, fig. 5.

Cucullus leopardus Röding, 1798, Mus. Boltenianum, p. 41.

Conus litteratus var. B. Dillwyn, 1817, Descr. Cat. Rec. Shells, 1: 357.

Conus millepunctatus Lamarck, 1822, Hist. Nat. Anim. sans Vert., 7: 461. (non *millepunctatus* Röding, 1798.)

Conus litteratus Linné var. *millepunctatus* Lamarck. Anton, 1839, Verzeichniss, p. 105.

Conus mille punctatus Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 167.

Conus millepunctatus Linné. Mörch, 1852, Catal. Conchyl. Yoldi, p. 66.

Dendroconus millepunctatus (Lamarck). Adams and Adams, 1853, Gen. Rec. Moll., 1: 250.

(?) *Leptoconus leopardus*. Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

Conus millepunctatus Bruguière. Sowerby, 1857, Thes. Conchyl., 3: 23, pl. 7, fig. 151.

Conus millipunctatus Lamarck. Theobald, 1860, Catal. Rec. Sh. Mus. Asiat. Soc. Bengal, p. 23.

Conus litteratus Linné var. *millepunctatus* Lamarck. Tryon, 1884, Man. Conch., 6: 10, pl. 2, fig. 19.

Conus millepunctatus Hwass. Von Martens and Thiele, 1903, Beschr. Gastrop. Deutsche Tiefsee Exp., p. 136.

Cucullus pardus Bolten. Iredale, 1929, Mem. Queensl. Mus., 9: 282. (error. *pardus* Röding, 1798 = *litteratus* Linné, 1758.)

Conus litteratus Linné var. *millepunctata* Lamarck. Dautzenberg and Bouge, 1933, Jour. Conchyl., 77: 78.

Conus millepunctatus Lamarck var. *aldrovandi* Dautzenberg, 1937, Mém. Mus. Roy. Hist. Nat. Belg., 2(18): 171. (non *aldrovandi* Risso, 1826.)

Conus litteratus pardus (Bolten). Suvatti, 1938, Molluscs of Siam, p. 39.

Conus litteratus pardus (Röding). Kira, 1955, Coloured Illus. Shells Japan, p. 72.

Lithoconus leopardus (Röding). Kaicher 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 5, fig. 13.

DESCRIPTION: Shell massive, conical. Body whorl with very obscure striae; base truncate; aperture rather narrow, the sides parallel. Shoulder smooth; spire depressed, spirally canaliculate and striate. Color of body whorl cream white, with many encircling rows of oblong bluish brown to black spots. One or two rows of small spots often alternate with one or two rows of large ones. The spots are more pronounced in smaller individuals. The body whorl of juvenile specimens is dark cream with narrow transverse white bands on which the dark spots are superimposed. The latter are more square than in adult specimens. Specimens 15 cm. or more in length may be almost completely unmarked. Color of aperture white or pale orange, sometimes yellow at the base. Periostracum olive brown, very thick, opaque. In life, exposed soft parts yellowish white, mottled with brown.

LENGTH: Ordinarily 150–200 mm. This species is the largest representative of the genus in Hawaii. A specimen in the collection of Mr. C. S. Weaver of Honolulu measures 221 × 124 mm.

TYPE LOCALITY: None.

REMARKS: *Conus leopardus* may be distinguished from *C. litteratus* Linné, its closest relative, by the following characteristics: *C. litteratus*, which does not occur in Hawaii, attains a length of only about 5 inches. It generally reaches its maximum width anterior of the shoulder, rather than at the shoulder, as in *C. leopardus*. The base of *C. litteratus* is pointed rather than truncate, and it typically

bears a black smudge at the base of the aperture. The spots are more nearly similar in size and more square, and the shell typically bears two broad yellow bands.

C. leopardus is occasionally found on reef platforms but occurs more commonly in depths of one fathom or more in bays and offshore. It is known to occur to a depth of 12 fathoms. Pleistocene fossils of *C. leopardus* are known from Oahu (Ostergaard, 1928).

Conus litoglyphus Hwass in Bruguière

Conus capitaneus var. δ . Gmelin, 1791, Syst. Nat., ed. 13, p. 3377.

Conus capitaneus var. ζ . Gmelin, 1791, Syst. Nat., ed. 13, p. 3377.

Conus litoglyphus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 692, pl. 338, fig. 8.

Cucullus cinamomeus Röding, 1798, Mus. Boltenianum, p. 43.

Cucullus orleanus Röding, 1798, Mus. Boltenianum, p. 44.

Conus subcapitaneus Link, 1807, Besch. Nat.-Samml. Univ. Rostock, Abt. 3, p. 103.

Conus lithoglyphus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 280.

Conus lithoglyphus Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 175.

Conus lacinulatus Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 108, fig. 2, p. 312.

Conus carpenteri Crosse, 1865, Jour. Conchyl., 13: 302, pl. 9, fig. 1.

(?) *Conus seychellensis* Nevill, 1874, Jour. Asiatic Soc. Bengal, 43(2): 22.

Conus lithoglyphus Reeve. Tomlin, 1937, Proc. Malac. Soc. Lond., 22: 268.

Dauciconus ermineus (Born). Cotton, 1945, Rec. South Austral. Mus., 8: 246.

Conus lithographus. Platt, 1949, Natl. Geog. Mag., 96: 53, fig. 2.

Conus inermis Born. Tinker, 1952, Pacific Sea Shells, p. 40.

Lithoconus ermineus (Born). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 4, fig. 10.

DESCRIPTION: Shell elongate; body whorl faintly and distantly striate toward the base,

the striae absolutely tuberculate. Aperture very narrow, the sides parallel. Color of body whorl dull yellow, reddish brown, or chestnut, often darker at the base, banded at the center and shoulder with rows of white blotches. Spire with alternate brown and white maculations on each whorl. Interior of aperture white.

LENGTH: 50 mm.

TYPE LOCALITY: "Mers des grandes Indes."

REMARKS: This species has often been referred to as *Conus ermineus* Born (Dautzenberg, 1937). Although Born did not provide a figure of *C. ermineus* and his brief description has been held by some (Burch, 1955) to be inadequate, the first figure reference given by Born (Valentyn, 1773: pl. 5, fig. 47) is a fairly good representation of the species under discussion. However, as was first pointed out by Brauer (1878), the two specimens on which Born's original description was based (Naturhistorisches Museum, Vienna, Nos. 4051 and 4052) are not conspecific with *C. litoglyphus* Hwass. Born's specimens are of the species later described by Lamarck (1810: 281) as *C. narcissus*.

Conus litoglyphus occurs rarely on Hawaiian reefs. It has been collected at a depth of 30 fathoms.

Conus lividus Hwass in Bruguière

Fig. 17 in Plate 1

Conus rusticus var. β Gmelin, 1791, Syst. Nat., ed. 13, p. 3383. (non *rusticus* Linné, 1758.)

Conus lividus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 630, pl. 321, fig. 5.

Conus rusticus Linné (Gmelin). Schreibers, 1793, Conchylienkenntniss, 1: 26.

Cucullus monachos Röding, 1798, Mus. Bolte-nianum, p. 39.

Conus plebejus Link, 1807, Beschr. Nat.-Samml. Univ. Rostock, Abt. 3, p. 106.

Conus lividus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 36.

(?) *Conus balteatus* Sowerby, 1833, Conch. Illus., p. 3, pt. 37, fig. 58.

Conus lividus Lamarck. Quoy and Gaimard, 1834, Voy. *Astrolabe* Zool., 3: 98, pl. 53, figs. 19-21.

Conus sanguinolentus Quoy and Gaimard, 1834, Voy. *Astrolabe* Zool., 3: 99, pl. 53, fig. 18.

Conus lividus Linné. Krauss, 1848, Die Südafrikanischen Molluscen, p. 130.

Conus rusticus Linné. Mörch, 1857, Catal. Suenson, p. 32. (error).

Conus citrinus Gmelin. Sowerby, 1857, Thes. Conchyl., 3: 4, pl. 4, fig. 70. (error).

(?) *Conus bocki* Sowerby, 1881, Proc. Zool. Soc. Lond., 1881: 636, pl. 56, fig. 7.

(?) *Conus prytanis* Sowerby, 1882, Proc. Zool. Soc. Lond., p. 117, pl. 5, fig. 1.

Conus plebeius Link. Tomlin, 1937, Proc. Malac. Soc. Lond., 22: 293.

Virgiconus lividus (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 254.

Rhizoconus lividus (Bruguière). Kira, 1955, Coloured Illus. Shells Japan, p. 75.

Stephanoconus lividus (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, fig. 13.

DESCRIPTION: Shell solid, with widely spaced transverse slightly elevated striae on the body whorl, the striae obsolete near the shoulder but strongly granulated basally. Aperture narrow, the sides parallel. Shoulder coronate; spire obtuse, coronated with large tubercles, striate, often eroded. Color olivaceous or orange brown, with tubercles of the spire and a transverse band below the shoulder white or bluish white. A central band on the body whorl light yellow, white, or bluish white. Color of aperture violet with a pale central transverse band; margin of outer lip yellow. Periostracum greenish brown, thick, opaque. In life, foot, rostrum and siphon black, finely mottled with more or less red, appearing reddish black.

LENGTH: Usually to 60 mm. A specimen 76 mm. in length, collected near Nanakuli, Oahu, is in the collection of Mr. A. M. Harrison of Honolulu.

TYPE LOCALITY: "Antilles," "Isle-de-France"

& aux Indes orientales." The first locality is undoubtedly in error. Île de France was an eighteenth-century French name for Mauritius, which was probably the source of Hwass's specimens.

REMARKS: *C. lividus* is one of the two most abundant species of *Conus* on Hawaiian coral reef platforms, the other being *C. flavidus*.

Conus marmoreus Linné

Fig. 9 in Plate 1

Conus marmoreus Linné, 1758, Syst. Nat., ed. 10, p. 712.

Conus nocturnus Solander, 1786, Cat. Portland Mus., p. 156, no. 3411.

Conus marmoratus Linné. Herbst, 1788, Hist. Verm., p. 176, pl. 43, fig. 1. (Not seen.)

Conus bandanus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 611, pl. 318, fig. 5.

Conus nocturnus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 611, pl. 318, fig. 1.

[*Conus tigrinus* Humphrey, 1797, Mus. Calonianum, p. 13.]

[*Conus nigritus* Humphrey, 1797, Mus. Calonianum, p. 13.]

Cucullus marmoreus (Gmelin). Röding, 1798, Mus. Boltenianum, p. 38.

Cucullus proarchithalassus Röding, 1798, Mus. Boltenianum, p. 38.

Conus proarchithalassius (Bolten). Link, 1807, Besch. Nat.-Samml. Univ. Rostock, Abt. 3, p. 105.

Conus marmoreus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 29.

Conus bandanus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 29.

Conus nocturnus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 30.

Conus maculatus Perry, 1811, Conchology, pl. 24, fig. 4.

Conus bandanus Lamarck. Sowerby, 1839, Conch. Illus., p. 4, pt. 155-156, fig. 121.

Conus nocturnus Lamarck. Sowerby, 1839, Conch. Illus., p. 4, pt. 155-156, figs. 122, 123.

Coronaxis bandanus (Lamarck). Swainson, 1840, Treatise on Malacol., p. 311.

Conus proarchithalassus (Bolten). Mörch, 1852, Catal. Conchyl. Yoldi, p. 64.

Conus deburghiae Sowerby, 1857, Thes. Conchyl., 3: 2, pl. 1, figs. 6, 7.

Conus nigrescens Sowerby, 1859, Proc. Zool. Soc. Lond., pt. 27: 429, pl. 49, fig. 2.

Conus crosseanus Bernardi, 1861, Jour. Conchyl., 9: 168, pl. 6, figs. 5, 6.

Conus pseudomarmoreus Crosse, 1875, Jour. Conchyl., 23: 223, pl. 9, fig. 4.

Conus marmoreus bandanus Hwass. de Burros e Cunha, 1933, Mem. Estud. Mus. Zool. Univ. Coimbra, Sér. 1, No. 71: 10.

Coronaxis bandanus (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 235.

Cucullus marmoreus (Linné). Kira, 1955, Coloured Illus. Shells Japan, p. 72.

Cucullus bandanus (Bruguière). Kira, 1955, Coloured Illus. Shells Japan, p. 72.

Conus marmoreus bandanus Lamarck. Katcher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 3, fig. 6.

DESCRIPTION: Shell large; body whorl obsoletely striate, its maximum diameter slightly anterior of the shoulder; aperture rather narrow, with almost parallel margins. Shoulder strongly coronate; spire depressed, coronate, striate. Large triangular pale flesh-colored markings separated by dark brown and crowded in two areas form broad irregular bands on the body whorl in specimens from the Hawaiian Islands, the anterior band being narrower. Aperture white or pale pink. Periostracum thin, yellow, translucent. In life, foot tan, siphon banded proximally from the tip with red, white, and black bands.

LENGTH: Usually to 100 mm. A specimen from Oahu in the B. P. Bishop Museum measures 139 mm.

TYPE LOCALITY: Asia.

REMARKS: Hawaiian representatives differ from typical *C. marmoreus*, in which the white markings are larger and less crowded and do not form bands. In some localities, such as New Caledonia (Crosse and Marie, 1874),

Bikini, the Philippines, both forms occur together, with intergrades. To the writer's knowledge, none of the typical forms of *C. marmoreus* have ever been collected in the Hawaiian Islands. The form found in Hawaii (and elsewhere) was described as *C. bandanus* Hwass in Bruguière. Most authorities regard the latter as a variety of *C. marmoreus*, which is probably valid in areas where both, as well as intergrades, occur. However, it is probably legitimate to consider the Hawaiian populations as belonging to the subspecies *Conus marmoreus bandanus* Hwass in Bruguière. It occurs uncommonly on Hawaiian reefs and has been collected at a depth of eight fathoms.

Conus miles Linné

Fig. 6 in Plate 1

Conus miles Linné, 1758, Syst. Nat., ed. 10, p. 713.

Cucullus miles (Gmelin). Röding, 1798, Mus. Boltenianum, p. 43.

Conus miles Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 171.

Leptoconus miles (Linné). Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

Rhizoconus miles (Linné). Frauenfeld, 1869, Verh. k.k. Zool.-Bot. Ges. Wien, 19: 863.

Lithoconus miles (Linné). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 5, fig. 3.

DESCRIPTION: Shell solid, with a moderately elevated spire. Body whorl smooth except for raised granular transverse ridges near the base. Aperture narrow, the sides parallel; outer lip thin. Shoulder obsoletely coronate; spire obsoletely tuberculate or plicate, rather faintly striate, concave in young individuals to straight or convex in larger ones. Color of body whorl yellowish white, with a broad, transverse blackish brown band above the center of the body whorl, and another at the base. The bands may be divided transversely into lighter and darker portions. Above and below the upper band, shell marked by narrow threadlike longitudinal dark brown lines,

which are continuous on the spire; the lines becoming more closely spaced in older individuals. The broad brown bands, alternating with white, are visible within the aperture. Periostracum greenish brown, with transverse rows of tufted ridges on the body whorl. In life, exposed soft parts greenish black.

LENGTH: 80 mm.

TYPE LOCALITY: India.

REMARKS: *C. miles* is rare on Hawaiian coral reefs and marine benches but occurs more commonly at depths of one to several fathoms. It has been collected at a depth of 26 fathoms.

Conus moreleti Crosse

Fig. 16 in Plate 1

Conus elongatus Reeve, 1843, Conch. Icon., 1: pl. 27, fig. 157. (non *elongatus* Borson, 1820.)

Conus oblitus Reeve, 1849, Conch. Icon., 1 (Emendns.): 1. (non *oblitus* Michelotti, 1847.)

Conus moreleti Crosse, 1858, Rev. Mag. Zool., Ser. 2, 10: 122.

Conus lividus Hwass var. *elongatus* Reeve. Weinkauff, 1874, Jahrb. Deutsch. Malak. Ges., 1: 262.

Conus lividus Bruguière var. *moreleti* Crosse. Paetel, 1887, Catal. Conch.-Samml. Paetel, 1: 299.

Stephanoconus moreleti (Crosse). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, fig. 14.

DESCRIPTION: Shell elongate, body whorl with raised, obsoletely knobbed striae basally, otherwise smooth; aperture very narrow, the sides parallel; outer lip thin. Shoulder coronate; spire low, convex, coronate, striate. Color of body whorl yellowish brown or olive, darker at the base, with lighter transverse bands at the shoulder and at the middle. Interior of aperture deep violet, outer lip yellow. Periostracum yellowish brown, rather thin, translucent, forming tufts on the tubercles.

LENGTH: 50 mm.

REMARKS: *C. moreleti* may be distinguished from *C. lividus*, its closest relative, by its elongate shape and small and closely spaced tubercles on the shoulder. It is rare on Hawaiian reefs but occurs more commonly at depths of a few fathoms.

Conus nussatella Linné

Fig. 19 in Plate 1

Conus nussatella Linné, 1758, Syst. Nat., ed. 10, p. 716.

Conus mussatellana Linné. Schröter, 1782, Mus. Gottwald., p. 23, pl. 13, figs. 96^a, 96^b, 96^c; pl. 43, fig. 52^a.

[*Conus punctulatus major* Humphrey, 1797, Mus. Calonianum, p. 15.]

Cucullus nussatella (Gmelin). Röding, 1798, Mus. Boitenianum, p. 50.

Hermes nussatellus (Linné). Montfort, 1810, Conchyl. Syst., 2: 399.

Coni nussatellae Linné. Müller, 1836, Synopsis Nov. Gen. Spec. Var. Testaceorum Viventum, p. 122.

Conus nussatella Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 178.

Hermes nussatula (Linné). Adams and Adams, 1853, Gen. Rec. Moll., 1: 256.

Conus nusatella Linné. Mörch, 1854, Catal. Hencks, p. 21.

Conus nusatella Linné. Weinkauff, 1873, Syst. Conch. Cab., ed. 2, 4: 151.

Hermes nussatella Linné. Schmeltz, 1874, Catal. Mus. Godeffroy, 5: 136.

Hermes nusatellata (Linné). Brazier, 1877, Proc. Linn. Soc. New South Wales, 1: 291.

Conus nussatellata Linné. Brazier, 1879, Jour. Conchol., 2: 192.

DESCRIPTION: Shell cylindrical, rather thin. Body whorl closely striate, the striae minutely granular. Aperture narrow, flaring slightly basally. Shoulder rounded; spire high, convex; apex sharp. Color yellowish white, clouded irregularly with orange brown or light purplish brown longitudinal splotches; with transverse rows of numerous small dark orange brown spots on the body whorl and

spire. Periostracum thin, yellow, translucent.

LENGTH: 60 mm.

TYPE LOCALITY: "Nussatello Insulam Asiae."

REMARKS: *C. nussatella* is a rare species in the Hawaiian Islands. Pleistocene fossils have been collected on Oahu by Ostergaard (1928) and the writer.

Conus obscurus Sowerby

Fig. 36 in Plate 2

Conus obscurus Sowerby, 1833, Conch. Illus., p. 2, pt. 29, fig. 26.

Conus obscurus Humphreys MSS. Reeve, 1843, Conch. Icon., 1: pl. 16, fig. 82.

Conus obscurus Reeve. Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 68, fig. 2, p. 347.

Nubecula obscura (Humphreys). Adams and Adams, 1853, Gen. Rec. Moll., 1: 249.

Conus tulipa Linné, juv. Pease, 1868, Am. Jour. Conch., 4: 126. (error).

Conus obscurus (Hwass) Reeve. Dautzenberg, 1937, Mém. Mus. Roy. Hist. Nat. Belg., 2: 193, pl. 3, fig. 9.

Conus halitropus Bartsch and Rehder, 1943, Proc. Biol. Soc. Wash., 56: 88.

Conus halitropus Dall, Bartsch and Rehder. Greene, 1953, Ann. Rept. Amer. Malacol. Union, Bull. 20: 28.

Tuliparia obscura (Reeve). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 291.

Gastridium obscurum (Sowerby). Kuroda, 1956, Venus: Jap. Jour. Mal., 19: 80.

DESCRIPTION: Shell elongate-ovate, very thin. Body whorl smooth except for very fine transverse grooves basally. Aperture rather broad, flaring basally. Shoulder smooth; spire moderately elevated, striate; apex pointed. Shell marked by irregularly shaped and distributed blotches and dots of light brown; the lighter areas separating them are violet. Periostracum very thin, translucent.

LENGTH: 30 mm.

TYPE LOCALITY: Arabia.

REMARKS: *C. obscurus* occurs rarely in shal-

low water in Hawaii and is apparently more common at depths of several fathoms.

Conus pennaceus Born

Fig. 3 in Plate 1

Conus pennaceus Born, 1780, Test. Mus. Caes. Vind., p. 167, pl. 7, fig. 14.

Conus aulicus var. α Gmelin, 1791, Syst. Nat., ed. 13, p. 3394.

Conus aulicus var. β Gmelin, 1791, Syst. Nat., ed. 13, p. 3394.

Conus aulicus var. γ Gmelin, 1791, Syst. Nat., ed. 13, p. 3394.

Conus aulicus var. ϵ Gmelin, 1791, Syst. Nat., ed. 13, p. 3394.

(?) *Conus omaria* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 743, pl. 344, fig. 3.

Conus rubiginosus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 746, pl. 344, figs. 1, 2.

(?) *Conus praelatus* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 746, pl. 345, fig. 4.

(?) *Conus episcopus* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 748, pl. 345, figs. 2, 6. (In part.)

(?) *Conus crocatus* Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 424.

(?) *Conus colubrinus* Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 433.

Conus pennaceus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 434.

Conus omaria Hwass var. β . Reeve, 1843, Conch. Icon., 1: pl. 32, sp. 177, figs. 177a, 177b.

Conus pennaceus Lamarck. Reeve, 1843, Conch. Icon., 1: pl. 32, sp. 177.

(?) *Conus elisae* Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 64, figs. 1, 1a, p. 341.

(?) *Conus stellatus* Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 99, fig. 3, p. 225.

Conus madagascariensis Sowerby, 1858, Thes. Conchyl., 3: 43, pl. 24, fig. 582.

Conus racemosus Sowerby, 1873, Proc. Zool. Soc. Lond., 1873: 721, pl. 59, fig. 11.

Conus auratus Hwass. Ostergaard, 1928, Bull. Bishop Mus., 51: 4, 29. (error).

Darioconus racemosus (Sowerby). Cotton, 1945, Rec. South Austral. Mus., 8: 257.

Darioconus pennaceus (Born). Cotton, 1945, Rec. South Austral. Mus., 8: 257.

Conus auratus Hwass. Morris, 1952, Field Guide to Shells Pac. Coast & Hawaii, p. 202, col. pl. 7, fig. 3. (error).

Cylinder pennaceus (Born). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 7, fig. 13.

DESCRIPTION: Shell ventricose, robust, broad at the shoulder; maximum diameter equal to or greater than one half the shell length. Body whorl obsoletely striate, the striae more pronounced basally. Aperture rather broad, flaring slightly basally. Shoulder smooth, usually somewhat rounded, but variable. Spire variable, depressed to moderately elevated, concave to slightly convex, obsoletely striate; protoconch nipplelike, rose colored. Ground color reddish brown (yellow specimens are occasionally found), with narrow transverse closely spaced lines, finely dotted with white. These areas are interrupted by large white subtrigonal blotches, grouped together like scales, usually forming a central band and sometimes additional bands at the shoulder and base. Color pattern of the body whorl usually continued on the spire. Interior of aperture white or bluish white. In life, foot pale brown mottled with darker brown; tip of siphon vermilion, followed proximally by white and black bands.

LENGTH: Usually to 65 mm. A specimen in the U. S. National Museum, collected at Hilo, Hawaii, measures 82 mm. in length.

TYPE LOCALITY: China.

REMARKS: Most specimens found in Hawaii agree fairly well with the original description and figure, although there is considerable morphological variation.

C. pennaceus is extremely similar to *C. omaria* Hwass in Bruguière. Tryon (1884) and some other authors have synonymized the two. Kiener (1849-1850: 340) listed characteristics by which the two species may be distinguished, stating under *C. pennaceus*, "C'est avec le *Conus omaria* que cette espèce a le plus d'analogie; le système de coloration de ces deux coquilles est à peu près semblable;

seulement, dans l'espèce ici décrite, les grandes zones sont plutôt longitudinales que transverses, et le réseau qui les constitue n'est pas aussi nettement limité. La form d'ailleurs est également différente; elle est toujours plu raccourcies et plue ventrue." The present writer has found that these distinctions generally hold, but it would be difficult to classify a small percentage of specimens collected in Hawaii using these criteria. If the two species eventually prove to be synonymous, the name *C. pennaceus* has priority over *C. omaria*.

C. pennaceus is one of the most common species on Hawaiian coral reef platforms. Fossils are known from Pleistocene deposits on Molokai (Ostergaard, 1939, as *C. omaria*).

C. elisae Kiener, here listed questionably as a synonym, is possibly a valid species. For an account of it, see page 396.

Conus pertusus Hwass in Bruguière

Fig. 31 in Plate 2

- Conus nobilis* Linné. Schröter, 1783, Einl. Conchyl., 1: 36, pl. 1, fig. 4. (error).
Conus pertusus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 686, pl. 336, fig. 2.
Conus pertusus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 278.
Conus amabilis Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 425.
Conus festivus Dillwyn, 1817, Descr. Cat. Rec. Shells, 1: 413.
 (?) *Conus inquinatus* Reeve, 1849, Conch. Icon. Suppl., pl. 5, sp. 251.
Hermes pertusus (Hwass). Adams and Adams, 1853, Gen. Rec. Moll., 1: 256.
Conus pertusus Lamarck. Sowerby, 1858, Thes. Conchyl., 3: 23, pl. 13, fig. 273.
Leptoconus pertusus. Schmeltz, 1874, Catal. Mus. Godeffroy, 5: 136.
Pionoconus pertusus (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 249.
Rhizoconus pertusus (Bruguière). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 290.
Lithoconus pertusus (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 5, fig. 4.

DESCRIPTION: Shell conical; body whorl encircled by distantly spaced punctate striae; aperture rather narrow, sides parallel. Shoulder smooth; spire low, convex, rather obtuse. Color rose, flaked with yellow or white, banded with two interrupted transverse rows of white or light pink blotches below the shoulder and centrally on the body whorl.

LENGTH: 40 mm.

TYPE LOCALITY: "Grandes Indes."

REMARKS: *Conus pertusus* is uncommon in Hawaii. It is known to occur subtidally to a depth of 25 fathoms.

Conus pulicarius Hwass in Bruguière

Fig. 12 in Plate 1

- Conus pulicarius* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 622, pl. 320, fig. 2.
Conus fustigatus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 623, pl. 320, fig. 1.
Cucullus punctulatus Röding, 1798, Mus. Boltinianum, p. 40.
Conus pulicarius Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 34.
Conus fustigatus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 35.
Conus pulicarius Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 174.
Conus vauitieri Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 100, fig. 3, p. 350.
Conus fustigatus Lamarck. Reeve, 1849, Conch. Icon. Temp. Index (Critical Analysis), unpaginated.
Puncticulis pulicarius (Hwass). Frauenfeld, 1869, Verh. k.k. Zool.-Bot. Ges. Wien, 19: 863.
Puncticulis pulicarius (Bruguière). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 289.
 DESCRIPTION: Shell thick and solid; body whorl with impressed transverse striae basally; aperture rather narrow, sides parallel. Shoulder coronate; spire moderately elevated, striate, coronate. Color white with dark brown to black spots, the spots often crowded into two transverse bands, one on each side of the center. Spire white, marked sparingly with

brown dots. Periostracum yellow, very thin and translucent in young individuals, thicker and brown in larger specimens. In life, foot and rostrum pale tan mottled with yellowish to reddish brown; tip of siphon reddish orange, followed proximally by pale buff and black bands.

LENGTH: Usually to 60 mm. A specimen collected by W. H. Christensen at Ala Moana Reef, Oahu, measures 74×42 mm. A specimen collected by C. S. Weaver measures 73×44 mm.

TYPE LOCALITY: Pacific Ocean.

REMARKS: *C. pulicarius* occurs in patches of sand on reef platforms and in bays. It has been collected at depths exceeding 40 fathoms.

Conus quercinus Solander

Fig. 4 in Plate 1; Fig. 23 in Plate 2

Conus quercinus Solander in Cat. Portland Mus., 1786, p. 67, no. 1501.

Conus cingulum Gmelin, 1791, Syst. Nat., ed. 13, p. 3378.

Conus quercinus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 681, pl. 332, figs. 5, 6.

Conus quercinus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 276.

Conus quercinus Hwass. Blainville, 1818, Dict. Sci. Nat., 10: 249.

Conus quercinus Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 172.

Dendroconus quercinus (Hwass). Adams and Adams, 1853, Gen. Rec. Moll., 1: 250.

Conus ponderosus Sowerby, 1858, Thes. Conchyl., 3: 54.

Lithoconus quercinus (Bruguière). Frauenfeld, 1869, Verh. k.k. Zool.-Bot. Ges. Wien, 19: 863.

Cleobula quercina (Solander). Cotton, 1945, Rec. South Austral. Mus., 8: 260.

Lithoconus quercinus (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 5, fig. 9.

DESCRIPTION: Shell large and solid, variable in obesity. Body whorl obsoletely striate, the striae becoming more pronounced basally;

aperture rather wide, sides parallel. Shoulder smooth, rounded. Spire depressed, concave, striate; apex raised. Color of body whorl yellow, encircled with numerous closely spaced transverse threadlike brown lines; spire usually paler yellow; interior of aperture white. Periostracum thick, brown, opaque. In life, foot and siphon brownish gray, heavily speckled with black.

LENGTH: Usually to 100 mm. A specimen from Oahu in the B. P. Bishop Museum measures 134 mm.

TYPE LOCALITY: None.

REMARKS: *C. quercinus* is found in large sandy areas in bays and to depths of more than 40 fathoms.

Conus rattus Hwass in Bruguière

Fig. 30 in Plate 2

Conus rattus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 700, pl. 338, fig. 7.

Conus taitensis Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 713, pl. 336, fig. 9.

Conus capitaneus var. C. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 266.

Conus rattus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 408.

Conus taitensis Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 424.

Conus capitaneus var. B. Küster, 1837-1840, Syst. Conch. Cab., ed. 2, 4: 8, pl. 14, figs. 13, 14.

Conus tabeitisensis Hwass. Reeve, 1843, Conch. Icon., 1: pl. 15, sp. 78.

Conus rattus Lamarck. Reeve, 1843, Conch. Icon., 1: sp. 78.

Conus tabeitisensis Hwass var. *rattus* Lamarck. Catlow and Reeve, 1845, Conchol. Nomencl., p. 322.

Leptoconus rattus (Lamarck). Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

Leptoconus tabeitisensis (Hwass). Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

Conus tabeitisensis Bruguière. Sowerby, 1857, Thes. Conchyl., 3: 5, pl. 2, fig. 26.

Conus viridis Sowerby, 1857, Thes. Conchyl., 3: 20, pl. 5, fig. 102.

Conus tabitiensis Bruguière. Schmelz, 1865, Catal. II Godeffroy, p. 20.

Conus rattus Solander. Schaufuss, 1869, Molluscorum Syst. Cat. Paetel, p. 45.

Conus tabitensis Bruguière. Schaufuss, 1869, Molluscorum Syst. Cat. Paetel, p. 45.

Conus ratus var. *tabitensis*. Ostergaard, 1928, B. P. Bishop Mus. Bull. 51: 29.

Conus tabitiensis Hwass (emend.). Dautzenberg and Bouge, 1933, Jour. Conchyl., 77: 89.

Rhizoconus rattus (Bruguière). Cotton, 1945, Rec. South Austral. Mus., vol. 8, p. 252.

Conus tabitensis Hwass. Mermod, 1947, Rev. Suisse Zool., 54: 208.

Litboconus rattus (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 5, fig. 1.

DESCRIPTION: Shell of moderate thickness; body whorl obsoletely striate near the shoulder, but distinctly so near the base, the striae closely spaced; aperture rather narrow, sides nearly parallel. Shoulder angular, smooth; spire rather low, obtuse, striate. Color of body whorl yellowish or violet brown, with large bluish white spots and maculations forming an interrupted central band and another at the shoulder. Shell below central band densely flecked with white, above band sparsely flecked with white. Spire with alternate brown and white blotches, continuing to form band on body whorl at shoulder. Aperture violet within. Periostracum thin, yellow, translucent, smooth or with raised ridges near growing edge. In life, foot, rostrum and siphon dark olive green, mottled with black.

LENGTH: Usually to 40 mm. A specimen collected by T. H. Richert on windward Oahu, and presently in the collection of the Children's Museum of Honolulu, measures 60 mm.

TYPE LOCALITY: "Mers d'Amérique," undoubtedly in error.

REMARKS: *C. rattus* occurs not uncommonly both on intertidal benches and on subtidal

reef platforms. Pleistocene fossils are known from Oahu (Ostergaard, 1928) and Maui (Ostergaard, 1939).

Conus retifer Menke

Fig. 32 in Plate 2

Conus retifer Menke, 1829, Verz. Ans. Conch.-Samml. Malsburg, p. 68.

Conus solidus Sowerby, 1834, Conch. Illus., p. 3, pt. 56, fig. 76. (non *solidus* Gmelin, 1791.)

Cylinder solidus (Sowerby). Adams and Adams, 1853, Gen. Rec. Moll., 1: 255.

Darioconus retifer (Menke). Cotton, 1945, Rec. South Austral. Mus., 8: 258.

Cylinder retifer (Menke). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 7, fig. 10.

DESCRIPTION: Shell very thick and solid, pear-shaped. Body whorl striate; aperture with almost parallel sides. Shoulder rounded, smooth. Spire elevated, acuminate, striate. Color reticulated orange brown with large and small white triangular markings, arranged as scales, and longitudinal chocolate and orange markings mostly interrupted to form two transverse bands. Color pattern of body whorl continued on spire; apex pink. Interior of aperture white or pale pink. Periostracum very thin, pale yellow, very translucent. In life, foot mottled brown. Tip of siphon vermilion, followed proximally by white and black bands.

LENGTH: 50 mm.

TYPE LOCALITY: None.

REMARKS: *C. retifer* is uncommon in Hawaii.

Conus spiceri Bartsch and Rehder

Fig. 8 in Plate 1

Conus spiceri Bartsch and Rehder, 1943, Proc. Biol. Soc. Wash., 56: 87.

Conus spiceri Dall, Bartsch and Rehder. Greene, 1953, Ann. Rept. Amer. Malacol. Union, Bull. 20: 28.

DESCRIPTION: Shell large and thick; body whorl marked by fine incremental lines and closely spaced spiral threads, becoming heav-

ier and more distantly spaced basally. Aperture fairly broad, widening somewhat basally. Shoulder broad, smooth, angular. Spire low, concave, singly striate. Color pale yellow, somewhat darker basally, with obscure white transverse bands. Interior of aperture bluish white. Periostracum thick, yellowish brown.

LENGTH: 110 mm.

TYPE LOCALITY: Midway Island.

REMARKS: This species, which is rather rare, is distinguished from *C. quercinus* in that it lacks the brown spiral lines, has a flatter spire, and is only singly striate on the summit. It is distinguished from *C. distans* by lacking the brown bands and tuberculate shoulder. Its closest relative is *C. virgo* Linné, which does not occur in Hawaii. *C. virgo* is easily distinguished from *C. spiceri* by the pronounced violet color of the base in the former.

To the author's knowledge, no specimens of *C. spiceri* have been collected outside the Hawaiian Islands.

Conus sponsalis Hwass in Bruguière

Figs. 38 and 39 in Plate 2

Conus sponsalis Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 635, pl. 322, fig. 1.

(?) *Conus ceylanensis* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 636, pl. 322, fig. 10.

Conus sponsalis Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 38.

Conus nanus Sowerby, 1833, Conch. Illus., p. 1, pt. 24, fig. 6.

Conus nanus Broderip, 1833, Proc. Zool. Soc. Lond., 1833: 53.

Coronaxis nanus (Broderip). Adams and Adams, 1853, Gen. Rec. Moll., 1: 248.

Coronaxis sponsalis. Adams and Adams, 1853, Gen. Rec. Moll., 1: 248.

Conus sponsalis Solander. Von Martens and Langkavel, 1871, Donum Bismarckianum. Samml. Südsee-Conchyl., p. 31.

Conus ceylonensis Hwass var. *sponsalis*. Tryon, 1884, Man. Conch., 6: 23, pl. 6, fig. 99.

Conus ceylonensis Hwass var. *nanus* Broderip. Tryon, 1884, Man. Conch., 6: 24, pl. 6, fig. 100.

Conus nana Broderip. Paetel, 1887, Catal. Conch.-Samml. Paetel, 1: 302.

Conus ceylanensis Hwass var. *pusillus*. Mant, 1922, Nautilus, 35: 84.

Conus ceylonensis Hwass. Ostergaard, 1935, B. P. Bishop Mus. Bull., 131: 21.

Virroconus sponsalis (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 237.

Stephanoconus sponsalis (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, fig. 5.

DESCRIPTION: Shell small but thick and solid, extremely variable with respect to several characteristics. Body whorl usually obsoletely striate, the striae somewhat more pronounced basally; aperture narrow, the sides parallel. Shoulder coronated with small tubercles which may be obsolete in large specimens. Spire usually moderately elevated, inner whorls coronated, but often eroded; 0-3 striae per whorl. Ground color of basal two thirds of body whorl typically pale blue; remaining area near the shoulder white; base tipped with brownish purple. In many specimens, no other coloration is present. Some individuals, chiefly younger specimens, marked with reddish or orange brown on body whorl; these markings generally of two arrangements, one or both of which may be present on the same shell: (1) encircling narrow bands of rather distantly separated dots or dashes separated by white dashes (Fig. 39); (2) interrupted longitudinal blotches of color (Fig. 38). Tubercles white, areas between them sometimes orange brown. Interior of aperture dark violet to brown, with white bands near the shoulder and centrally; outer lip white. Periostracum thin, translucent, sometimes becoming thicker and opaque at the growing edge, or in larger specimens. In life, foot pale pink, mottled with white, darker pink at extremities. Siphon and rostrum pale pink or white, tipped with darker pink; tentacles white.

LENGTH: To 30 mm. Most specimens smaller.

TYPE LOCALITY: "Île Saint-George."

REMARKS: Specimens from Hawaiian populations agree with the original figure and Broderip's (1833) description of *Conus nanus*, which has not generally been considered a distinct species. A number of workers (Pease, 1868; Tryon, 1884; Ostergaard, 1935; Tomlin, 1937; Tinker, 1952) have considered *C. nanus* to be not specifically distinct from *C. ceylanensis*.

C. ceylanensis does not seem to be a well-known species. Specimens from many Indo-West Pacific localities in the U. S. National Museum and Museum of Comparative Zoology collections are indistinguishable from representatives of the Hawaiian populations under consideration.

Examination of specimens from many Indo-West Pacific island groups in the U. S. National Museum, Museum of Comparative Zoology, and Academy of Natural Sciences of Philadelphia, and personal observations of the writer in the Marshall Islands led to the conclusions that the widespread *C. sponsalis* is also extremely variable and that there is sufficient morphological overlap with the Hawaiian forms for the latter to be considered conspecific with *C. sponsalis*. However, since most Hawaiian specimens are morphologically distinguishable from most specimens from other parts of the central and western Pacific, the Hawaiian populations may validly be accorded subspecific rank and termed *C. sponsalis nanus* Sowerby.

Tryon (1884: 24), who was also uncertain of the distinction between *C. sponsalis* and *C. ceylanensis*, considered *C. nanus* a variety of the latter in his arrangement but considered the possibility that both were varieties of *C. sponsalis*. Ostergaard (1935) also listed "*Conus ceylonensis sponsalis*," under which he stated, "I believe that this shell intergrades with *C. ceylonensis* Hwass and should therefore be termed a variety of that species, as Tryon places it."

Although the identity of *C. ceylanensis* remains problematical, the present writer is inclined to agree that it is probably conspecific

with *C. sponsalis*. In this case, the name *sponsalis* has page priority, and there seems no reason why it should not take precedence over *ceylanensis*. It is hoped that collections in Ceylon and other Indian Ocean areas, to be made by the writer in the near future, will contribute towards a more definitive solution to this question.

C. sponsalis is one of the most abundant species of *Conus* on intertidal benches in Hawaii. Pleistocene fossils are known from Oahu (Ostergaard, 1928) and Molokai (Ostergaard, 1939).

Conus striatus Linné

Fig. 5 in Plate 1

Conus striatus Linné, 1758, Syst. Nat., ed. 10, p. 716.

Cucullus striatus (Gmelin). Röding, 1798, Mus. Boltenianum, p. 50.

Conus striatus Lamarck. Quoy and Gaimard, 1834, Voy. Astrolabe Zool., 3: 89, pl. 52, figs. 10, 10¹.

Leptoconus striatus (Linné). Adams and Adams, 1853, Gen. Rec. Moll., 1: 254.

Tuliparia striata. Gray, 1857, Guide Moll. Brit. Mus., 1: 5.

Conus floridus Sowerby, 1858, Thes. Conchyl., 3: 47, frontispiece, fig. 558.

Cheilyconus striatus (Linné). Frauenfeld, 1869, Verh. k.k. Zool.-Bot. Ges. Wien, 19: 863.

Conus tulipa Linné var. *floridus* Sowerby. Weinkauff, 1874, Jahrb. Deutsch. Malak. Ges., 1: 284.

Phasmoconus striatus (Linné). Cotton, 1945, Rec. South Austral. Mus., 8: 260.

Dendroconus striatus (Linné). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 292.

DESCRIPTION: Shell large, rather thin, elongate-ovate, the maximum diameter not at the shoulder but about one fifth of the distance from shoulder to base. Body whorl with fine, closely spaced transverse striae; aperture broad, flaring gradually toward the base. Shoulder angular, smooth. Spire striate,

canaliculate, usually concave, often extremely so and depressed below the shoulder, a peculiarity not typically found in specimens from other areas. Ground color pinkish white, irregularly clouded with blotches of brown or purplish brown composed of closely spaced transverse lines. Spire tessellated with brown and white. Interior of aperture white. Periostracum thin, yellow, translucent. In life, foot, siphon and rostrum tan mottled with brown.

LENGTH: Usually to 110 mm. A specimen measuring 120 × 53 mm. is in the collection of C. S. Weaver.

TYPE LOCALITY: "Hitoe."

REMARKS: Specimens from the Hawaiian Islands are characterized by having the spire depressed often to such an extent that the apex does not extend beyond the shoulder of the body whorl. In juvenile specimens, the spire is elevated and the sides of the aperture almost parallel.

C. striatus occurs uncommonly on Hawaiian reefs. It is typically found associated with a sand substratum. Pleistocene fossils of *C. striatus* have been collected by the author on Oahu.

Conus suturatus Reeve

Figs. 24–28 in Plate 2

Conus suturatus Reeve, 1844, *Conch, Icon.*, 1: pl. 45, sp. 250; suppl. pl. 3, fig. 250b.

Dendroconus suturatus (Reeve). Adams and Adams, 1853, *Gen. Rec. Moll.*, 1: 250.

Conus turbinatus Sowerby, 1858, *Thes. Conchyl.*, 3: 25, pl. 10, fig. 227.

Litboconus hawaiiensis Bartsch and Rehder. Kaicher, 1956, *Indo-Pacific Sea Shells*, Sect. 5, pl. 5, fig. 6.

DESCRIPTION: Shell solid; body whorl obsoletely striate toward the shoulder, the striae more pronounced, impressed but with an adjacent ridge, widely spaced toward the base. In young specimens, the striae are more pronounced over the entire body whorl. Aperture narrow, sides parallel. Shoulder angular,

smooth; spire elevated in younger specimens, less so in larger ones, deeply striate, characterized by a ridge on each whorl at the junction of the preceding whorl. Ground color white, with broad transverse bands of orange brown (in smaller specimens) or orange pink (in larger specimens) on the body whorl. Base stained with pale orange brown or pale rose. Interior of aperture white. In smaller specimens, narrow bands of orange brown rectangles encircle the body whorl. Spire maculated with orange brown and white. Periostracum smooth, dark brown, opaque.

Most specimens from Hawaii are characterized by having the spire more elevated than those of the shells described and figured by Reeve.

LENGTH: To 50 mm.

TYPE LOCALITY: Port Essington, Australia.

REMARKS: *C. suturatus* is very closely related to *C. tessulatus*. In the latter, the rows of square or quadrangular blotches persist in adult specimens and vary from orange brown to, more usually, pink. In *C. suturatus*, this pattern is present in young specimens but is gradually superseded by the broad solid orange pink transverse bands mentioned in the description, and the transverse rows of rectangles are usually lost, as the shell grows larger. Some specimens of the two species may be virtually indistinguishable. In young *C. suturatus*, the broad transverse bands typically underly the juvenile pattern, the entire body whorl is usually striate, and the basal striae are accompanied by an adjacent ridge. In young *C. tessulatus* all areas between the rectangular blotches are typically white, impressed spiral striae occur only basally, and the areas between the striae are typically flat. The upper portion of the shell is smooth. Older, larger specimens of these two species are usually distinguishable by differences in color pattern cited in the accompanying descriptions.

C. suturatus is not common in shallow water in Hawaii, but many specimens have been

dredged in 4–50 fathoms off the major islands.

C. ambiguus Reeve (1844, *Conch. Icon.*, 1: pl. 44, sp. 244) appears to be extremely similar and possibly identical. Some specimens collected in Hawaii have been labeled *C. ambiguus*. A definitive statement concerning *C. ambiguus* will not be made here, pending study of type material.

Conus tessulatus Born

Fig. 22 in Plate 2

Conus tessulatus Born, 1778, *Ind. Rer. Nat. Mus. Caes. Vind.*, p. 131.

Conus virgo var. γ Gmelin, 1791, *Syst. Nat.*, ed. 13, p. 3376.

Conus tessellatus Born. Bruguière, 1792, *Enc. Meth. Vers.*, 1: 641.

Cucullus pavementum Röding, 1798, *Mus. Boltenianum*, p. 41.

Conus tessellatus Lamarck. Menke, 1828, *Synopsis Methodica Molluscorum*, p. 45.

Conus tessellatus Lamarck. Dufo, 1840, *Ann. Sci. Nat.*, Ser. 2, 14: 173.

Conus desselatus Lamarck. Reichenbach, 1842, *Land.-, Süsw.- u. See-Conch.*, p. 51, pl. 17, figs. 376, 377.

Conus tessellatus Bruguière. Kiener, 1845, *Spéc. Gén. Icon. Coq. Viv.*, 2: pl. 17, fig. 1, p. 68.

Dendroconus tessellatus (Born). Adams and Adams, 1853, *Gen. Rec. Moll.*, 1: 250.

Conus tessalatus Born. Theobald, 1860, *Catal. Rec. Sh. Mus. Asiat. Soc. Bengal*, p. 24.

Conus tesselatus Born. Weinkauff, 1874, *Jahrb. Deutsch. Malak. Ges.*, 1: 245.

Conus tesselatus Bruguière. G. R. Batalha, 1878, *Catal. Coll. F. R. Batalha*, p. 25.

Conus tessellatus Hwass. Dautzenberg, 1893, *Bull. Soc. Zool. France*, 18: 80.

Conus edaphus Dall, 1910, *Proc. U. S. Natl. Mus.*, 38: 223.

Conus tessullatus Born. Hirase, 1954, *Illus. Handbk. Shells*, p. 88, pl. 113, fig. 17.

Lithoconus tessulatus (Born). Kaicher, 1956, *Indo-Pacific Sea Shells*, Sect. 5, pl. 5, fig. 11.

DESCRIPTION: Shell fairly thick and stout.

Body whorl smooth near the shoulder, bearing rather widely spaced impressed striae basally; base grooved; aperture narrow, the sides parallel; outer lip thin. Shoulder smooth, angular; spire concave, deeply striate, characterized by a ridge on each whorl at the junction of the preceding whorl; apex pointed. Ground color white, body whorl encircled by rows of quadrangular pinkish orange spots, usually crowded to form two transverse bands. Base characteristically stained with violet. Spire tessellated with pink and white. Interior of aperture white, violet at the base. In life, "yellowish white, foot mottled with brownish buff, anteriorly spotted with black; creeping disk buff yellow with darker veins; siphon creamy yellow tinged with brown, edged with yellow, with a transverse black spot at the anterior end" (Garrett, 1878).

LENGTH: 35–40 mm.

TYPE LOCALITY: Africa.

REMARKS: This species is extremely rare in shallow water in the Hawaiian Islands although it is widely distributed throughout the Indo-West Pacific region and reaches the west coast of Mexico (Hanna and Strong, 1949). Only one specimen collected alive in the Hawaiian Islands is known with certainty to the writer. It was collected by S. Sato in Haleiwa Bay, Oahu, depth 25 feet, and is in the Children's Museum of Honolulu, on loan from Mrs. Jean Bromley.

C. tessulatus was recorded from Hawaii by Garrett (1878). Dautzenberg (1937: 244) states that it was also recorded from Hawaii by P. Fischer, but no further reference is given. Three specimens in the U. S. National Museum, collected by the U. S. Exploring Expedition, are labeled "Sandwich Is." (and are shown in Plate 2, Fig. 22), but this locality datum is not to be considered reliable (J. P. E. Morrison, verbal communication).

Conus textile Linné

Fig. 2 in Plate 1

Conus textile Linné, 1758, *Syst. Nat.*, ed. 10, p. 717.

- Conus undulatus* Solander in Cat. Portland Mus., 1786, p. 180, no. 3866.
- Conus archiepiscopus* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 747, pl. 345, fig. 5; pl. 346, figs. 1, 7.
- Cucullus auriger* Röding, 1798, Mus. Boltanium, p. 49.
- Cucullus gloria-maris* Röding, 1798, Mus. Boltanium, p. 49. (non *Conus gloria-maris* Chemnitz, 1777.)
- Cucullus textile* (Gmelin). Röding, 1798, Mus. Boltanium, p. 50.
- Conus panniculus* Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 435.
- Cylinder textile* (Linné). Montfort, 1810, Conchylogie Systematique, 2: 391.
- (?) *Conus pyramidalis* Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 438.
- Conus gloria-maris* Perry, 1811, Conchology, pl. 25, no. 5. (non *gloria-maris* Chemnitz, 1777.)
- Conus rete-aureum* Perry, 1811, Conchology, pl. 25, no. 5.
- Conus textiles* Lamarck. Dufo, 1840, Ann. Sci. Nat., Ser. 2, 14: 177.
- Conus textilis*. Gray, 1842, Fig. Moll. Anim., pl. 10, fig. 1.
- Conus victoriae* Reeve, 1843, Conch. Icon., 1: pl. 37, figs. 202a, 202b.
- Conus verriculum* Reeve, 1843, Conch. Icon., 1: pl. 38, figs. 208a, 208b.
- Conus concatenatus* Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 110, fig. 1, p. 362.
- Conus telatus* Reeve, 1848, Conch. Icon., 1: suppl. pl. 1, fig. 270.
- Conus scriptus* Sowerby, 1858, Thes. Conchyl., 3: 41, pl. 23, fig. 563.
- Conus tigrinus* Sowerby, 1858, Thes. Conchyl., 3: 41, pl. 23, fig. 569.
- (?) *Conus condensus* Sowerby, 1866, Thes. Conchyl., 3: 326, pl. 26, fig. 622.
- Conus paniculus* Lamarck. Paetel, 1873, Catal. Conch.-Samml. Paetel, p. 51.
- Cylindrus textile* (Linné). Morelet, 1889, Jour. Conchyl., 37: 133.
- Darioconus textile* (Linné). Cotton, 1945, Rec. South Austral. Mus., 8: 257.
- Darioconus textilis* (Linné). Kuroda, 1955, Venus: Jap. Jour. Mal., 18: 291.
- DESCRIPTION: Shell large, ventricose, rather thin, subcylindrical-ovate. Maximum diameter of about one half shell length is reached about one fifth of the distance from shoulder to base. Body whorl transversely striate, the striae fine and closely spaced; aperture broad, flaring basally. Shoulder smooth; spire elevated, concave, acuminate, striate. Ground color white, with undulating longitudinal brown lines, interrupted by white triangles arranged as scales, and broad orange brown maculations disposed to form two or three interrupted transverse bands on the body whorl; the maculations streaked longitudinally with waved darker brown lines. Spire similarly marked. Interior of aperture white. Periostracum thin, yellow, translucent. In life, foot mottled brown on white. Tip of siphon reddish orange, followed proximally by bands of white and black; remainder of siphon white with closely spaced narrow brown bands.
- LENGTH: To 100 mm.
- TYPE LOCALITY: Banda Islands.
- REMARKS: *C. textile* is rare in Hawaiian waters. It is found occasionally on reef platforms and to depths of at least 12 fathoms.

Conus vexillum Gmelin

Fig. 11 in Plate 1

- Conus vexillum* Gmelin, 1791, Syst. Nat., ed. 13, p. 3397.
- (?) *Conus sumatrensis* Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 655, pl. 327, fig. 8.
- Cucullus canonicus* Röding, 1798, Mus. Boltanium, p. 43. (non *Conus canonicus* Hwass in Bruguière, 1792.)
- Conus vexillum* Linné. De Fremery, 1802, Mus. Meyer., p. 82. (Not seen.)
- Conus vexillum* Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 268.
- (?) *Conus leopardus* Dillwyn, 1817, Descr. Cat. Rec. Shells, 1: 364. (non *leopardus* Röding, 1798.)

Conus sulphuratus Kiener, 1845, Spéc. Gén. Icon. Coq. Viv., 2: pl. 66, fig. 3; pl. 78, fig. 4; p. 130.

Leptoconus vexillum. Adams and Adams, 1853, Gen. Rec. Moll., 1: 252.

Conus planorbis Born. Oostingh, 1928, Misc. Zool. Sumatrana, no. 28: 4. (error. Fide Misc. Zool. Sum., no. 49: 6.)

Rhizoconus vexillum (Gmelin). Cotton, 1945, Rec. South Austral. Mus., 8: 251.

DESCRIPTION: Shell large, rather thin. Body whorl obsoletely striate; aperture rather broad, sides parallel. Shoulder broad, angular, smooth. Spire moderately elevated, obtuse, somewhat canaliculate, striate. Color of body whorl white, broadly banded with yellowish brown, stained with darker brown at the base, with irregular chocolate longitudinal waved lines which often branch and are partially interrupted to form a white band at the middle and another at the shoulder. Spire white with yellow apex and broad radiating chocolate bands, some of which are continuous on the body whorl. Interior of aperture white. Periostracum dark green, thick, opaque; ridged. In life, foot and siphon greenish black.

LENGTH: To 135 mm.

TYPE LOCALITY: None.

REMARKS: Although this species was first reported from Hawaii as *C. vexillum* (Garrett, 1878), it has generally been known in Hawaii as *C. sumatrensis*. Examination of specimens in the U. S. National Museum and in collections made by the author in Micronesia as well as Hawaii revealed morphological overlap and intergrades between typical specimens of both species. Further confusion is found in the literature. Kiener (1847: 81) stated under *C. sumatrensis*, "Coquille qui par sa forme se rapproche de la précédente [*C. vexillum*]; elle est reconnaissable surtout par ses lignes longitudinales ramifiées." Tryon (1884: 39) stated, on the other hand, under *C. vexillum*, "Spire often variegated with white and chestnut broad flames, the latter often overlaying also the lighter chestnut of the body whorl." Most authorities have considered the two as

distinct species. The figures given in Reeve (1843: pls. 1 and 3) show extreme variants, while the specimens figured by Sowerby (1857: pl. 7) are hardly distinguishable.

C. vexillum is a relatively uncommon species on Hawaiian reefs. It is known to occur to a depth of 25 fathoms. Pleistocene fossils are known from Molokai (Ostergaard, 1939, as *C. sumatrensis*).

Conus vitulinus Hwass in Bruguière

Fig. 14 in Plate 1

Conus vitulinus Hwass in Bruguière, 1792, Enc. Meth. Vers, 1: 648, pl. 326, fig. 3.

Conus vitulinus Bruguière. Lamarck, 1810, Ann. Mus. Hist. Nat. Paris, 15: 265.

Conus vulpinus Schubert and Wagner, 1829, Syst. Conch. Cab., 12: 56, pl. 222, fig. 3073. (non *vulpinus* Hwass in Bruguière, 1792.)

Conus vulpinus Wagner var. A. Küster, 1837-1840, Syst. Conch. Cab., ed. 2, 4: 29, pl. 3, fig. 7. (non *vulpinus* Hwass in Bruguière, 1792.)

Conus planorbis var. *vitulinus* Hwass. Mörch, 1852, Catal. Conchyl. Yoldi, p. 69.

Dauciconus vitulinus (Bruguière). Cotton, 1945, Rec. South Austral. Mus., 8: 246.

Leptoconus vitulinus (Bruguière). Kira, 1955, Coloured Illus. Shells Japan, p. 36.

Lithoconus vitulinus (Hwass). Kaicher, 1956, Indo-Pacific Sea Shells, Sect. 5, pl. 2, no. 7a.

DESCRIPTION: Shell thick and solid. Body whorl obscurely striate near the shoulder, the striae becoming more pronounced and granular basally. Aperture narrow, the sides parallel. Shoulder angular, smooth; spire depressed, slightly canaliculate, striate. Color of body whorl usually deep reddish or purplish brown, darker at the base, with white bands mottled with ground color at the shoulder and below the center; the bands contain one to several rows of brown dots. In large specimens, the reddish brown areas often interrupted by longitudinal white blotches. Spire arcuately tessellated with brown and white. Perios-

tracum gray, thick, opaque, closely striate transversely. In life, visible portions of foot and siphon bright lemon yellow.

LENGTH: 70 mm.

TYPE LOCALITY: Indian Ocean.

REMARKS: Small specimens of this species closely resemble *C. litoglyphus*. *C. vitulinus* may be distinguished by having striae above the central band, rows of brown dots on the white bands, and absence of a pointed apex.

C. vitulinus is a relatively uncommon species on Hawaiian reefs. It is known to occur to a depth of 30 fathoms. Pleistocene fossils are known from Molokai (Ostergaard, 1939).

A single specimen labeled *Conus planorbis* Born in the collection of the B. P. Bishop Museum (No. 68990) was dredged in Honolulu Harbor. The Museum of Comparative Zoology contains another specimen (No. 146332) collected at Midway Island by J. Chalean, apparently alive when collected. These specimens are extremely similar to, and may be synonymous with, *C. vitulinus*, as has been suggested by some workers (p. 395).

POSSIBLE ADDITIONAL VALID SPECIES
IN HAWAII

Conus elisae Kiener

Fig. 4

Conus elisae Kiener, 1845, Spéc. Gén. Icon.

Coq. Viv., 2: pl. 64, figs. 1, 1a, p. 341.

(?) *Conus stellatus* Kiener, 1845, Spéc. Gén.

Icon. Coq. Viv., 2: pl. 99, fig. 3, p. 225.

DESCRIPTION: Shell subcylindrical; maximum diameter slightly more than one half the length. Body whorl obsoletely striate, the striae slightly more pronounced and as raised ridges toward the base. Aperture rather broad, flaring slightly basally. Shoulder smooth, rounded. Spire moderately elevated, obtuse, straight or slightly convex, obsoletely striate. Color dark reddish brown, as many closely spaced and intersecting longitudinal lines separated by small white spots; occasionally with larger white subtrigonal blotches as in

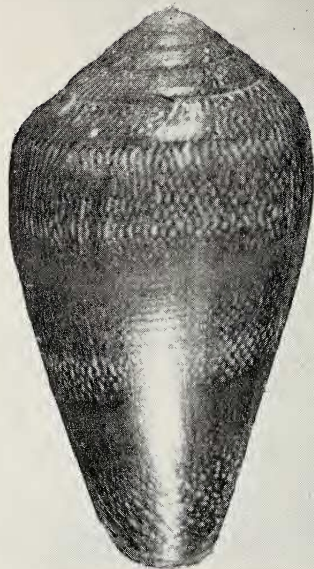


FIG. 4. "*Conus elisae* Kiener," 35 × 19 mm. Specimen collected by C. E. Cutress on Rabbit Island, off Oahu. Photograph by C. E. Cutress.

C. pennaceus; two broad transverse bands either side of the center appear to be superimposed on this pattern. These bands are more solidly colored and are similar to the reddish brown areas of *C. pennaceus* in that they bear narrow transverse closely spaced lines finely dotted with white. Color pattern of the spire similar to that of the bands on the body whorl. Interior of aperture bluish white.

LENGTH: Specimens in the U. S. National Museum and Academy of Natural Sciences of Philadelphia range from 15.5 mm. to 27 mm. in shell length. The specimen illustrated in Figure 3 measures 35 × 19 mm.

TYPE LOCALITY: None.

REMARKS: *Conus elisae* was first reported from Hawaii by Weinkauff (1874). Recently, a number of specimens agreeing with the description and figure of this species have been collected on the islands of Kauai and Niihau. Sowerby (1858: 43) considered this species to be synonymous with *C. pennaceus*, a conclusion with which the present writer has been inclined to agree. However, no specimens intermediate in character between

Kiener's *C. elisae* and typical *C. pennaceus* have been found, despite an increasing number of specimens collected during the past year. Moreover, the microhabitat of the Hawaiian specimens referred to seems to differ from that of typical *C. pennaceus*. The former are typically found buried as deep as six inches under sand (A. H. Cornelison, verbal communication) while the latter are typically found on or partly buried in sand under rocks (Kohn, 1959). It seems reasonable at the present time to consider *C. elisae* as a possibly valid species. The problem requires further investigation.

UNIQUE RECORD FROM HAWAII

Conus smirna Bartsch and Rehder

Fig. 13 in Plate 1

This species is known only from a single specimen, the type, described by Bartsch and Rehder (1943). It was dredged near Lanai ("Ranai") in 257–312 fathoms by the U. S. Fisheries steamer "Albatross."

SPECIES KNOWN IN HAWAII ONLY FROM COLLECTION OF DEAD SPECIMENS

To the author's knowledge, there are no records of living specimens of the following species from the Hawaiian archipelago.

Conus aulicus Linné

C. auratus is probably a synonym of *C. aulicus*.

Ostergaard (1928) listed *C. auratus* as occurring in the fossil state on Oahu. The present writer is quite convinced that the species referred to was *C. pennaceus*, since Ostergaard (1928) also mentions the normal habitat of living specimens. However, at least one fossil specimen of *C. aulicus* is known from Oahu. It was collected about five feet above high tide mark near Nanakuli by E. C. Jones in March, 1954. It is at present in the collection of the Children's Museum of Honolulu (No. 2747).

Specimens now considered to be narrow-shelled variants of *C. pennaceus* because of the abundance of intergrades were listed as *C. auratus* by Edmondson (1933). Edmondson (1946) cited both *C. auratus* and *C. omaria*. The same figure of a rather typical shell of *C. pennaceus* was labelled *C. auratus* by Edmondson (1933) and "*Conus omaria* (?)" in the 1946 edition.

Specimens of *C. aulicus* were collected by the Tanager Expedition at Kure (Ocean) Island and Pearl and Hermes Reef and are in the collection of the B. P. Bishop Museum (Nos. 66438, 66439, 66205). A shell from Midway Island which is quite fresh in appearance but was empty when collected is in the collection of C. A. Allen.

Conus aureus Hwass in Bruguière

A number of well-preserved shells of this species have been collected on beaches along the windward coast of Oahu.

Conus auricomus Hwass in Bruguière

This species has been known erroneously as *C. clavus* Linné (see Dodge, 1953). Several specimens have been collected from dredged material at Honolulu, Oahu, and at Midway Island. *C. magnificus* Reeve, recorded by Garrett (1878) from the Hawaiian Islands, is probably synonymous. A label, "*Conus magnificus* Reeve. Hawaiian Ids.," is present in the Garrett collection in the B. P. Bishop Museum, but no shell is present.

Conus cylindraceus Broderip and Sowerby

Several shells have been collected from dredged material at Midway Island. No specimens are known from the main Hawaiian Islands (Thaanum, *in litt.*).

Conus fabula Sowerby (= *Conus scabriusculus* Dillwyn?)

The only known specimen, probably a subfossil, was collected at Makua, Oahu, by W. C. Ross.

Conus tenuistriatus Sowerby

Some authors have considered this species synonymous with (Tryon, 1884) or a variety of (Couturier, 1907; Dautzenberg, 1933) *Conus glans* Hwass *in* Bruguière. Several dead specimens have been dredged and a few have been collected on beaches in the Hawaiian Islands.

Conus tulipa Linné

Ostergaard (1928) reported collection of several fossil specimens, one of which is figured, of *Conus tulipa*. The identification of a fossil specimen, presumably collected by Ostergaard, in the Hawaii Marine Laboratory reference collection, has been verified by the writer as *C. tulipa*. Ostergaard (1928) referred to a "live immature specimen" of *C. tulipa* collected in Hawaii by C. H. Edmondson. It is possible that the specimen referred to was a *C. obscurus*, as several older specimens of that species were labeled *C. tulipa*. However, a single juvenile specimen of *C. tulipa* (No. 20), collected at Waikiki Reef, Oahu, is in the Hawaii Marine Laboratory reference collection. It is not known whether or not this specimen was alive when collected, but it is in fresh condition. A number of shell fragments of *C. tulipa* have also been collected on Hawaiian beaches.

UNVERIFIED AND INACCURATE RECORDS
FROM THE HAWAIIAN ISLANDS

Conus arenatus Hwass *in* Bruguière

A single beach specimen, labeled "Hawaii. coll. W. H. Pease," is in the U. S. National Museum (No. 5038). No other specimens are known from the Hawaiian Islands, and the record may be in error as to locality.

Conus aristophanes Sowerby

This species, considered by Tomlin (1937) and others as synonymous with *C. coronatus* Gmelin, was described by Sowerby (1858) from the Philippine and Hawaiian islands. The latter locality is almost certainly in error.

Conus atramentosus Reeve

This is the type species of the genus *Lovellona* of Iredale (1917). Thiele (1931) considers *Lovellona* a section of the genus *Mitromorpha* A. Adams (1865) and places it in the subfamily Cytharinae of the family Conidae. Other authorities place *Mitromorpha* in the family Pleurotomidae (Simroth, 1896-1907).

Conus cancellatus Hwass *in* Bruguière

The type locality of this species is given in Bruguière (1792: 713) as "l'isle d'Owhyhée dans l'océan pacifique." This is presumably an error, since no specimens from the Hawaiian Islands are known to the writer, although there is some resemblance to *C. acutangulus*. *C. cancellatus* is found in Japan.

Conus emaciatus Reeve

This species, considered by Tomlin (1937) and others as a juvenile of *C. virgo* Linné, was reported from the Hawaiian Islands by Sowerby (1858: pl. 12, sp. 191). This reference may be in error, since no specimens from Hawaii are known to the writer or D. Thaanum (*in litt.*).

Conus fusiformis Pease

Pease (1860) described this species from the Hawaiian Islands. It belongs to the genus *Mitromorpha*. (See under *C. atramentosus*.)

Conus miliaris Hwass *in* Bruguière

A specimen in the U. S. National Museum (No. 338481) now labeled "*Conus miliaris* Hwass" was collected by D. Thaanum at Keaukaha, near Hilo, Hawaii. Three live specimens were found in a sand pocket in the reef and apparently none have been collected since (Thaanum, *in litt.*). The specimens were first labeled by W. H. Dall as a variety of *C. abbreviatus*. The single discovery of three individuals in a small area suggests a small, isolated, aberrant population with possible fixation of atypical morphological character-

istics by genetic drift. The circumstances of collection thus lend support to Dall's conclusion that the specimens represent a variant of *C. abbreviatus*. However, the specimens agree quite completely on morphological grounds with typical *C. miliaris*, which is otherwise not known to occur in the Hawaiian Islands. It is possible that the specimens under consideration may have hatched elsewhere and have been carried ashore on Hawaii by currents during the pelagic larval stage. In either event, the population has apparently not become established in Hawaii.

The Museum National d'Histoire Naturelle, Paris, contains two additional specimens labeled "Kauai (Sandwich) Rémy 1857."

Conus parvus Pease

Pease (1868) having discovered that *C. fusiformis* was preoccupied, renamed that species *C. parvus*. See under *C. fusiformis*.

Conus virgo Linné

Although Garrett (1878) reported this species from the Hawaiian Islands, there is no specimen in the Garrett collection in the B. P. Bishop Museum, and no other records are known to the writer. Demond (1957) also lists this species from Hawaii.

SUMMARY

The gastropod genus *Conus* is represented by 33 species in the Hawaiian archipelago. This number comprises only species of which more than one individual has been collected alive in the area between Kure (Ocean) Island and the island of Hawaii. Synonymies, descriptions, type localities, and notes are given for each of these species.

One possibly additional valid species, a unique record of one species, seven species known in Hawaii only from the collection of dead specimens, and unverified and inaccurate records of nine species from the Hawaiian Islands, are cited.

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